

PROJECT MANUAL

for

Academy

SPORTS+OUTDOORS

3299 US 412

Siloam Springs, AR 72761

Store # XXX

Vendors: Refer to Sheet G0.03 AND G0.04 for a complete list of vendors, contractors and responsibilities.

PROJECT NO. 2505269

DATE: 11-21-2025

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BIDDING REQUIREMENTS

BIDDING REQUIREMENTS (INCLUDING INVITATION TO BIDS, INSTRUCTIONS TO BIDDERS, AND BID FORMS) WILL BE PROVIDED BY ACADEMY SPORTS + OUTDOORS AND ARE NOT INCLUDED IN THE PROJECT MANUAL.

CONTRACTING REQUIREMENTS (INCLUDING CONSTRUCTION CONTRACT BETWEEN ACADEMY SPORTS + OUTDOORS AND CONTRACTOR, BOND, AND CERTIFICATE FORMS) ARE ISSUED BY THE OWNER (ACADEMY SPORTS + OUTDOORS) UNDER SEPARATE COVER AND ARE NOT INCLUDED IN THE PROJECT MANUAL.

DIVISION 01 - GENERAL REQUIREMENTS

011000	SUMMARY
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012500	SUBSTITUTION PROCEDURES
012600	CONTRACT MODIFICATION PROCEDURES
012900	PAYMENT PROCEDURES
013100	PROJECT MANAGEMENT AND COORDINATION
013200	CONSTRUCTION PROGRESS DOCUMENTATION
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014000	QUALITY REQUIREMENTS
014216	DEFINITIONS
014219	REFERENCE STANDARDS
014533	CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES
015000	TEMPORARY FACILITIES AND CONTROLS
016000	PRODUCT REQUIREMENTS
017000	EXECUTION AND CLOSEOUT REQUIREMENTS
017419	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
017800	CLOSEOUT SUBMITTALS
017823	OPERATION AND MAINTENANCE DATA
017900	DEMONSTRATION AND TRAINING
019113	GENERAL COMMISSIONING REQUIREMENTS

DIVISION 03 - CONCRETE

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033560	MODIFIED POLISHED CONCRETE FLOOR FINISH
033565	BURNISHED CONCRETE FLOOR FINISH
034500	PLANT-PRECAST ARCHITECTURAL CONCRETE
034713	TILT-UP CONCRETE
035413	PORTLAND CEMENTITIOUS UNDERLAYMENT
039050	CONCRETE REAIR AND JOINT FILLER REPLACEMENT

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044313	STONE MASONRY VENEER
047200	CAST STONE MASONRY
047300	MANUFACTURED STONE MASONRY

DIVISION 05 - METALS

051200	STRUCTURAL STEEL FRAMING
052100	STEEL JOIST FRAMING
053100	STEEL DECKING
054000	COLD-FORMED METAL FRAMING
055000	METAL FABRICATIONS
055133	METAL LADDERS
055213	PIPE & TUBE RAILINGS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

061000	ROUGH CARPENTRY
062023	INTERIOR FINISH CARPENTRY
064116	PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS
064216	WOOD PANELING
066400	PLASTIC PANELING

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

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072119	FOAMED-IN-PLACE INSULATION
072400	EXTERIOR INSULATION AND FINISH SYSTEMS
072500	WEATHER BARRIERS
072726	FLUID APPLIED MEMBRANE AIR BARRIERS
074113	METAL ROOF PANELS

075400	THERMOPLASTIC MEMBRANE ROOFING
076200	SHEET METAL FLASHING AND TRIM
077100	ROOF SPECIALTIES
077200	ROOF ACCESSORIES
078413	PENETRATION FIRESTOPPING
079200	JOINT SEALANTS

DIVISION 08 - OPENINGS

081113	HOLLOW METAL DOORS AND FRAMES
082100	IMPACT RESISTANT INTERIOR DOORS AND DOOR FRAME PROTECTORS
083113	ACCESS DOORS AND FRAMES
083323	OVERHEAD COILING DOORS
083457	SECURITY SHUTTERS
083830	TRAFFIC DOORS
084113	ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
084229	SLIDING AUTOMATIC CART DOOR
084229.23	IMPACT RATED SLIDING AUTOMATIC ENTRANCES
084600	SWINGING AUTOMATIC ENTRANCES
086200	UNIT SKYLIGHTS
087100	DOOR HARDWARE
088000	GLAZING
088700	SUN CONTROL WINDOW FILM

DIVISION 09 - FINISHES

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092900	GYPSUM BOARD
095123	ACOUSTICAL CEILINGS
096513	RESILIENT BASE AND ACCESSORIES
096816	CARPETING
097200	WALL COVERINGS
099113	EXTERIOR PAINTING
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102113	POWDER COATED TOILET COMPARTMENTS
102800	TOILET, BATH, AND LAUNDRY ACCESSORIES
104400	FIRE PROTECTION SPECIALTIES
107316.13	METAL CANOPIES

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111316	LOADING DOCK SEALS AND HOODS
111319	STATIONARY LOADING DOCK EQUIPMENT

DIVISION 12 – FURNISHINGS

124814	ENTRANCE FLOOR MATS AND FRAMES

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220015	COORDINATION OF PLUMBING EQUIPMENT
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220519	METERS AND GAUGES FOR PLUMBING PIPING
220523	GENERAL-DUTY VALVES FOR PLUMBING PIPING
220529	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
220548	VIBRATION & SEISMIC CONTROLS
220553	IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
220719	PLUMBING PIPING INSULATION
221111	MECHANICALLY JOINED PLUMBING PIPING SYSTEMS
221113	FACILITY WATER DISTRIBUTION PIPING
221116	DOMESTIC WATER PIPING
221119	DOMESTIC WATER PIPING SPECIALTIES
221316	SANITARY WASTE AND VENT PIPING
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221413	STORM DRAINAGE PIPING

223300	ELECTRIC, DOMESTIC-WATER HEATERS
224000	PLUMBING FIXTURES
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230517	SLEEVES AND SLEEVE SEALS FOR HVAC PIPING
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230553	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593	TESTING, ADJUSTING, AND BALANCING FOR HVAC
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231123	FACILITY NATURAL-GAS PIPING
233113	METAL DUCTS
233300	AIR DUCT ACCESSORIES
233423	HVAC POWER VENTILATORS
233713	DIFFUSERS, REGISTERS, AND GRILLES
234100	PARTICULATE AIR FILTRATION
237413	PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS
238239	WALL-MOUNTED UNIT HEATERS
239100	TESTING REQUIREMENT AND COMPLETION FORM
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DIVISION 26 – ELECTRICAL

260010	GENERAL ELECTRICAL REQUIREMENTS
250050	COMMON WORKS FOR ELECTRICAL
260502	EQUIPMENT WIRING SYSTEMS
260504	PROVISIONS FOR ELECTRIC UTILITY SERVICE
260519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

260533	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
260544	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
260548.16	SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
260553	IDENTIFICATION FOR ELECTRICAL SYSTEMS
260923	LIGHTING CONTROL DEVICES
262200	LOW-VOLTAGE TRANSFORMERS
262413.21	INTEGRATED FACILITIES SWITCHBOARDS
262416	PANELBOARDS
262726	WIRING DEVICES
262813	FUSES
262816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
265100	INTERIOR LIGHTING
265600	EXTERIOR LIGHTING
266100	TESTING REQUIREMENTS AND COMPLETION FORM
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280500	COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY
280513	CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY
281111	DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEMS
281600	INTRUSION DETECTION
285100	TESTING REQUIREMENTS AND COMPLETION FORM
285200	O & M REQUIREMENTS AND COMPLETION FORM

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312200	GRADING
312316	EXCAVATION
312316.13	TRENCHING
312323	FILL
312500	EROSION AND SEDIMENTATION CONTROLS
313700	RIPRAP

DIVISION 32 – EXTERIOR IMPROVEMENTS

320519	GEOSYNTHETICS FOR EXTERIOR IMPROVEMENTS
321120	SUBBASE AND AGGREGATE BASE COURSE
321216	ASPHALT PAVING
321313	CONCRETE PAVING
321416	BRICK UNIT PAVING
321623	SIDEWALKS
321723	PAVEMENT MARKINGS
321726	TACTILE WARNING SURFACING

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330110.58	DISINFECTION OF WATER UTILITY PIPING SYSTEMS
330561	CONCRETE MANHOLES
331416	SITE WATER UTILITY DISTRIBUTION PIPING
333113	SITE SANITARY SEWERAGE GRAVITY PIPING
334100	SUBDRAINAGE
334211	STORMWATER GRAVITY PIPING
334230	STORMWATER DRAINS
334600	STORMWATER MANAGEMENT

APPENDIX A - GEOTECHNICAL REPORT

The Geotechnical Report is the responsibility of the Geotechnical Engineering Consultant, and not the responsibility of the Architect of Record. The Geotechnical Report is made available for Bidders' convenience and information but is not a warranty of existing conditions. This document and its attachments are not part of the Contract Documents.

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55K PROTOTYPE 2025 Q3 RELEASE 8-19-2025

<u>ACADEMY, LTD.</u>	<u>OWNER</u>
1540 N. MASON RD., KATY, TX 77449	(281) 6465200

<u>CASCO DIVERSIFIED CORPORATION</u>	<u>ARCHITECT</u>
12 SUNNEN DR., SUITE 100, ST. LOUIS, MO 63143	(314) 821-1100

<u>CASCO DIVERSIFIED CORPORATION</u>	<u>STRUCTURAL ENGINEER</u>
12 SUNNEN DR., SUITE 100, ST. LOUIS, MO 63143	(314) 821-1100

<u>CASCO DIVERSIFIED CORPORATION</u>	<u>MEP ENGINEER</u>
12 SUNNEN DR., SUITE 100, ST. LOUIS, MO 63143	(314) 821-1100

<u>CODE CONSULTANTS, INC.</u>	<u>FIRE PROTECTION ENGINEER</u>
2043 WOODLAND PARKWAY, SUITE 300, ST. LOUIS, MO 63143	(314) 991-2633

END OF SECTION

**SECTION 000102
PROJECT INFORMATION**

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

- A. Project Name: Academy Sports and Outdoors - 55k Prototype 2025 Q3 Release 8-19-2025, located at: **3299 US 412 in Siloam Springs, AR 72761.**
- B. Architect's Project Number: 2505269
- C. Owner's Project Number: _____
- D. Construction Manager's Project Number: _____
3299 US 412
Siloam Springs, AR 72761.
- E. The Owner, hereinafter referred to as Academy Sports and Outdoors.

1.02 NOTICE TO PROSPECTIVE BIDDERS

1.03 PROJECT DESCRIPTION

- A. Summary Project Description: New 1-story retail store with loading dock
- B. Contract Scope: Construction, demolition, renovation, hazardous material removal, site acquisition, construction financing, and facility operations during occupancy.
- C. Contract Terms: Lump sum (fixed price, stipulated sum).

1.04 PROJECT CONSULTANTS

- A. The Architect, hereinafter referred to as Architect: CASCO Diversified Corporation
 - 1. Address: 12 Sunnen Drive, Suite 100
 - 2. City, State, Zip: St. Louis, MO 63143
 - 3. E-mail: academysports@thecdcompanies.com

1.05 PROCUREMENT TIMETABLE "UPDATE AS REQUIRED"

- A. Pre-Bid Briefing: ____ at ____.
- B. Pre-Bid Site Tour: ____ at ____.
- C. Last Request for Substitution Due: 7 days prior to due date of bids.
- D. Last Request for Information Due: 7 days prior to due date of bids.
- E. Bid Due Date: MM-dd-yyyy, before 4 PM local time.
- F. Bid Opening: Same day, 5 PM local time.
- G. Notice to Proceed: Within 7 days after due date.
- H. Bids May Not Be Withdrawn Until: 30 days after due date.
- I. Contract Time: ____ calendar days.
- J. Desired Construction Start: Not later than ____.
- K. Desired Substantial Completion Date: Not later than ____ calendar days from Notice to Proceed.
- L. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.06 PROCUREMENT DOCUMENTS

- A. Availability of Documents: Complete sets of procurement documents may be obtained:
 - 1. From Owner at the Project Manager's address listed above.
- B. Documents may be viewed at _____.

1.07 SIGNATURE

A. For: _____

B. By: _____

1. Signed: _____

2. (Authorized signing officer)

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 000103 - PROJECT DIRECTORY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Identification of project team members and their contact information.

1.02 OWNER:

- A. Name: Academy, Ltd., a Texas limited partnership, dba Academy Sports + Outdoors.
 - 1. Address Line 1: 1540 N. Mason Road
 - 2. City: Katy
 - 3. State: TX
 - 4. Zip Code: 77449
 - 5. Telephone: 281.646.5926
- B. Primary Contact: All correspondence from the Contractor to the Architect will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
 - 1. Title: Project Manager.
 - 2. Name: Katie Hepting.
 - 3. Email: katie.hepting@thecdcompanies.com

1.03 CONSULTANTS:

- A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
 - 1. Company Name: CASCO Diversified Corporation
 - a. Address Line 1: 12 Sunnen Dr., Suite 100
 - b. City: St. Louis
 - c. State: Missouri.
 - d. Zip Code: 63143
 - e. Telephone: 314.821.1100
 - f. Email: academysports@thecdcompanies.com
 - 2. Primary Contact: Connor Endres
 - a. Title: Account Manager
 - b. Email: academysports@thecdcompanies.com
- B. Civil Engineering Consultant:
 - 1. Company Name: MATKINHOOVER
 - a. Address Line 1: 210 Spring Hill Dr
 - b. Address Line 2: Suite 130
 - c. City: Spring
 - d. State: Texas
 - e. Zip Code: 77386
 - f. Telephone: 830.249.0600
 - g. Fax: _____.
 - 2. Primary Contact:
 - a. Title: Project Manager.
 - b. Name: Spencer Rivers.
 - c. Email: srivers@matkinhoover.com.
- C. Landscape Architecture Consultant:
 - 1. Company Name: CASCO Diversified Corporation
 - a. Address Line 1: 12 Sunnen Drive

- b. Address Line 2: Suite 100
 - c. City: St. Louis
 - d. State: Missouri
 - e. Zip Code: 63143
 - f. Telephone: 314.821.1100
 - g. Fax:_____.
- 2. Primary Contact:
 - a. Email: academysports@theccdcompanies.com
- D. Structural Engineering Consultant:
 - 1. Company Name: CASCO Diversified Corporation
 - a. Address Line 1: 12 Sunnen Drive, Suite 100
 - b. City: St. Louis
 - c. State: Missouri
 - d. Zip Code: 63143
 - e. Telephone: 314.821.1100
 - f. Fax:_____.
 - 2. Primary Contact:
 - a. Email: academysports@theccdcompanies.com
- E. Mechanical Engineering Consultant - HVAC:
 - 1. Company Name: CASCO Diversified Corporation
 - a. Address Line 1: 12 Sunnen Drive
 - b. Address Line 2: Suite 100
 - c. City: St. Louis
 - d. State: Missouri
 - e. Zip Code: 63143
 - f. Telephone: 314.821.1100
 - 2. Primary Contact:
 - a. Email: academysports@theccdcompanies.com
- F. Electrical Engineering Consultant:
 - 1. Company Name: CASCO Diversified Corporation
 - a. Address Line 1: 12 Sunnen Drive
 - b. Address Line 2: Suite 100
 - c. City: St. Louis
 - d. State: Missouri
 - e. Zip Code: 63143
 - f. Telephone: 314.821.1100
 - g. Fax:_____.
 - 2. Primary Contact:
 - a. Email: academysports@theccdcompanies.com
- G. Building Automation System Consultant:
 - 1. Company Name: _____.
 - a. Address Line 1: _____.
 - b. Address Line 2: _____.
 - c. City: _____.
 - d. State: _____.
 - e. Zip Code: _____.
 - f. Telephone: _____.
 - g. Fax:_____.
 - 2. Primary Contact:
 - a. Title: _____.
 - b. Name: _____.

H. Building Security Consultant:

1. Company Name: _____.
 - a. Address Line 1: _____.
 - b. Address Line 2: _____.
 - c. City: _____.
 - d. State: _____.
 - e. Zip Code: _____.
 - f. Telephone: _____.
 - g. Fax: _____.
2. Primary Contact:
 - a. Title: _____.
 - b. Name: _____.
 - c. Email: _____.

I. Commissioning Agent:

1. Company Name: _____.
 - a. Address Line 1: _____.
 - b. Address Line 2: _____.
 - c. City: _____.
 - d. State: _____.
 - e. Zip Code: _____.
 - f. Telephone: _____.
 - g. Fax: _____.
2. Primary Contact:
 - a. Title: _____.
 - b. Name: _____.
 - c. Email: _____.

1.04 CONSTRUCTION MANAGER: CPM

A. Company Name: CDP Alliance.

1. Address Line 1: _____.
2. Address Line 2: _____.
3. City: _____.
4. State: _____.
5. Zip Code: _____.
6. Telephone: _____.
7. Fax: _____.

B. Primary Contact:

1. Title: Construction Project Manager.
2. Name: Chris Pond.
3. Email: chris@cdpalliance.com.
4. Phone: (614) 832-8927

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 000107 - SEALS PAGE

ARCHITECT OF RECORD

**Kristen M. Mack
CASCO Diversified Corporation
12 Sunnen Drive, Suite 100
St. Louis, MO 63143**

Architect of Record

Date

STRUCTURAL ENGINEER OF RECORD

The following Engineer has provided professional services to the Architect for the referenced project and has assisted in the preparation of the specifications.

Michael Thomas Lee
CASCO Diversified Corporation
12 Sunnen Drive, Suite 100
St. Louis, MO 63143

Structural Engineer of Record

Date

MECHANICAL ENGINEER OF RECORD

The following Consultant has provided professional services to the Architect for the referenced project and has assisted in the preparation of the specifications.

Scott A. Mosely
CASCO Diversified Corporation
12 Sunnen Drive, Suite 100
St. Louis, MO 63143

Mechanical Engineer of Record

Date

ELECTRICAL ENGINEER OF RECORD

The following Consultant has provided professional services to the Architect for the referenced project and has assisted in the preparation of the specifications.

David A. Tretter
CASCO Diversified Corporation
12 Sunnen Drive, Suite 100
St. Louis, MO 63143

Electrical Engineer of Record

Date

FIRE PROTECTION ENGINEER OF RECORD

The following Consultant has provided professional services to the Architect for the referenced project and has assisted in the preparation of the specifications.

**Fire Protection Engineer
CCI
2043 Woodland Parkway, Suite 300
St. Louis, MO 63146**

Fire Protection Engineer of Record

Date

END OF SECTION 000107

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Academy Sports + Outdoors
SECTION 006325 - SUBSTITUTION REQUEST FORM

NO. _____

TO: _____

DATE: _____

ATTN: _____

We hereby submit the following for your consideration in lieu of the specified item(s) for the above project:

Specification Section _____. Paragraph _____. Referenced Drawing(s) _____

Specified Item: _____

Proposed Substitution: _____

Reason for Substitution: _____

.....
COMPLETE THE FOLLOWING (Use additional sheets if necessary).

1. Does the substitution affect dimensions shown on Drawings? Yes _____. No _____.
If yes, indicate changes: _____

2. What effect does the substitution have on other trades? _____

3. What effect do applicable code requirements have on substitution? _____

4. Describe the differences between the proposed substitution and the specified item(s):

5. How do manufacturer guarantees compare between proposed and specified items?

☐ Same

☐ Different (Explain on back.)

Attachments: _____
.....

What is projected lump sum installed cost difference between proposed substitution and least expensive specified item? \$ _____. [Ø; (decrease); increase]

The undersigned hereby

- Certifies that the proposed substitute item has been fully investigated and has been determined to be equal or superior to that specified in all respects; that the same or greater warranty will be furnished, that required maintenance service and source for replacement parts are available, and that incorporation of the proposed substitute item will not affect functional clearances.
- Warrants that coordination, installation, and changes to the project as necessary to accommodate the proposed substitution shall be the Contractor's responsibility, that use of the substitute item(s) will not delay project completion, and that claims for additional costs related to its incorporation which may become subsequently apparent will be borne by the Contractor.

Approved For Architect Review: _____

Signature

Title

Signature shall be by a person having authority to legally bind the Contractor to the above terms.

☐ Substitution Recommended
Subject to Owner's Consent

☐ Substitution Recommended
As Noted
Subject to Owner's Consent

☐ Substitution Not
Recommended

☐ Substitution Returned –
Insufficient Information

Date: _____

By: _____ (Architect of Record)
Signature Title

Owner's Consent ☐ Yes

☐ No

Date: _____

By: _____ OWNER
Signature Title

END OF SECTION

SECTION 011000 – SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Academy Sports and Outdoors - 55k Prototype 2025 Q3 Release 8-19-2025
 - 1. **New 1-story retail store with loading dock**
- B. Owner's Name: Academy, Ltd..
- C. Architect's Name: **CASCO – 12 Sunnen Dr., Suite 100, St. Louis, MO 63143..**
- D. Additional Project contact information is specified in Section 000103 - Project Directory.
- E. The Project consists of the construction of a new 55,000 sf ground-up concrete tilt-up wall construction retail store

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 005200 - Agreement Form.

1.03 WORK BY OWNER

- A. Owner will supply and install the following:
 - 1. Store merchandise fixtures and casework.
 - 2. Building Signs.
 - 3. Appliances.
 - 4. Trash Compactor.
 - 5. Bike Racks
- B. Owner will supply the following for installation by Contractor:
 - 1. Roof Top HVAC units and control devices .
 - 2. Electrical panels and switch gear..
 - 3. Safety switches.
 - 4. Dry type transformers.
 - 5. Interior lighting and lamps.
 - 6. Building exterior lighting and lamps.
 - 7. Refer to sheet G0.03 and G0. - for complete list of Vendors, Contractors and responsibilities.

1.04 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

1.06 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012000 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.

1.02 RELATED REQUIREMENTS

- A. Section 012600 - Contract Modification Procedures - for administrative procedures for handling changes to the contract.
- B. Section 013200 - Construction Progress Documentation - for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.03 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- G. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- H. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Submit one electronic and three hard-copies of each Application for Payment.
- H. Include the following with the application:

1. Transmittal letter as specified for submittals in Section 013000.
 2. Construction progress schedule, revised and current as specified in Section 013000.
 3. Current construction photographs specified in Section 013000.
 4. Partial release of liens from major subcontractors and vendors.
 5. Partial and Final waivers.
 6. Project record documents as specified in Section 017800, for review by Owner which will be returned to the Contractor.
 7. Affidavits attesting to off-site stored products.
- I. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 5 business days.
- E. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 016000.
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- G. Substantiation of Costs: Provide full information required for evaluation.
1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 2. Support each claim for additional costs with additional information:

- a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
- 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- K. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 017000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 006325 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).
- B. Section 013000 - Administrative Requirements: Submittal procedures, coordination.
- C. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.04 REFERENCE STANDARDS

- A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.
- B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
 - 1. Owner will consider requests for substitutions only if submitted at least 10 business days prior to the date for receipt of bids.
- B. Submittal Form (before award of contract):
 - 1. Submit substitution requests by completing the form in section 006325. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 - 1. Submit substitution requests by completing the form in section 006325. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Architect will consider requests for substitutions only within 15 business days after date of Agreement.
- C. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions" or Architect designated form.

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Work Change Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect and Construction Manager.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 016000 Product Requirements if the proposed change requires substitution of one product or system for product or system specified.
7. Work Change Proposal Request Form: Use form acceptable to Architect.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than five days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual Table of Contents as a guide to establish line items for the Schedule of Values. Provide at least one (1) line item for each Specification section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange Schedule of Values consistent with format of AIA Document G703.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued **evaluation** of Applications for Payment and progress reports. Coordinate with Project Manual Table of Contents.
 - 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 PAYMENT FOR MATERIAL STORED OFF-SITE

- A. The Owner will pay for the actual cost of material for the Work stored off-site (less stipulated retainage) under the following conditions.
 1. Ownership of the material will be transferred to the Owner by title and lien releases shall be given by the Contractor and the supplier.
 2. Storage will be in a bonded warehouse, in the Owner's name and fully insured.
 3. The Contractor shall pay all costs related to the storage including loading, unloading, transportation, warehouse rent and insurance.
 4. Material has been inspected by the Owner, or his representative, to ascertain compliance with the Contract Documents.
 5. General Contractor must provide photographs of Material and any receipts of Payment.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit One signed and notarized original copies of each Application for Payment to Architect via Owner provided Project Management web site. Copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of Mechanic's lien from entities lawfully entitled to file a Mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's construction schedule (preliminary, if not final).
 4. Submittal schedule (preliminary, if not final).
 5. List of Contractor's staff assignments.
 6. List of Contractor's principal consultants.
 7. Copies of building permits.
 8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 9. Initial progress report.
 10. Report of preconstruction conference.
 11. Certificates of insurance and insurance policies.
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

- I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

REVISION NOTES:

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:
 - 1. Definitions
 - 2. Informational Submittals
 - 3. General Coordination Procedures.
 - 4. Requests for Information (RFIs).
 - 5. Project Management Web Site.
 - 6. Project Meetings.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different sections of the Specifications and in different disciplines in the drawings, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative procedures include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout procedures.
 8. Startup and adjustment of systems.
- D. Staff Names: Within five (5) days of Notice to Proceed, submit a list of the Contractor's principal staff assignments including the Superintendent and other personnel in attendance at the site; list telephone numbers of the temporary field office as well as for the Contractor's main office. Post copies of the list in the temporary field office and each temporary telephone.
- E. The Contractor shall assign a competent full-time Superintendent acceptable to the Owner. The Superintendent shall be maintained on the Project until the Soft Opening Date.
- 1.5 REQUESTS FOR INFORMATION (RFIs)
- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted directly to Architect by other entities that are controlled by Contractor with no response.
 2. Contractor to coordinate and submit RFIs directly to the Architect in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation along with the following information:

1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor/Construction Company
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as applicable.
 9. Drawing number and detail references, as applicable.
 10. Field dimensions and conditions, as applicable.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact(s) in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing information or interpretation.
- C. RFI Forms: Use the Academy RFI form at the end of this section. AIA Document G716 or a Software-generated form with substantially the same content as indicated above that is acceptable to Architect.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond accordingly. RFI's should be responded to by the Architect with resolution between 1-3 business days from receipt of RFI, depending on complexity of response. Final response not to exceed 3 business days unless mutually agreed upon by the Architect and Academy.
1. The following RFIs will be returned by the Architect without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within five (5) days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.

2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as applicable.

1.6 PROJECT MANAGEMENT WEB SITE

A. Use Owner's Project Management Web Site for purposes of hosting and managing project communication and documentation until Final Completion. Project Management Web Site shall include the following functions:

2. Meeting minutes.
3. Contract modifications forms and logs.
4. RFI forms and logs.
5. Photo documentation.
6. Schedule and calendar management.
7. Submittals forms and logs.
8. Payment application forms.
9. Drawing and specification document hosting, viewing, and updating.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three (3) days of the meeting.

B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect.

1. Attendees: Authorized representatives of Owner, Construction Manager, Architect and Engineering/Design Consultants, Contractor and the Site Superintendent, major subcontractors, suppliers, and other concerned parties shall attend the

conference. Participants at the conference shall be familiar with Project and be authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including, but not limited to the following:

- a. Tentative construction schedule.
- b. Phasing.
- c. Critical work sequencing and long-lead items.
- d. Designation of key personnel and their duties.
- e. Procedures for processing field decisions and Change Orders.
- f. Procedures for RFIs.
- g. Procedures for testing and inspecting.
- h. Procedures for processing Applications for Payment.
- i. Distribution of the Contract Documents.
- j. Submittal procedures.
- k. Preparation of record documents.
- l. Use of the premises.
- m. Work restrictions.
- n. Working hours.
- o. Owner's occupancy requirements.
- p. Responsibility for temporary facilities and controls.
- q. Procedures for moisture and mold control.
- r. Procedures for disruptions and shutdowns.
- s. Construction waste management and recycling.
- t. Parking availability.
- u. Office, work, and storage areas.
- v. Equipment deliveries and priorities.
- w. First aid.
- x. Security.
- y. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes. Sample Preconstruction Agenda and Minutes are located at the end of this section.

- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction activities.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager, and Owner's Commissioning Authority of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

- a. Contract Documents.
- b. Options.
- c. Related RFIs.
- d. Related Change Orders.
- e. Purchases.

- f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 - z. Protection of adjacent property/sites as applicable.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at periodic intervals as set by ASO CPM.

- 1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.
- 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- 1) Review schedule for next period.

- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
- 3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Pre-Slab Meeting:

- 1. Meeting planned, hosted and attended by Contractor. A representative of Structural Engineers will chair the meeting. Schedule meeting between 7 and 14 days prior to first concrete interior slab placement of 10,000 SF or greater.
- 2. Attendees:
 - a. Owner's Project Manager or Representative.
 - b. Structural Engineer's Representative (by teleconference or site visit)
 - c. Independent Testing Contractor.
 - d. Contractor's Project Manager.
 - e. Contractor's Superintendent (who must be present during all major slab placements).
 - f. Concrete Slab Sub-Contractor's Project Manager.
 - g. Concrete Slab Sub-Contractor's Finish Foreman (who must be present during all major slab placements).
 - h. Base Fine Grading Contractor.
 - i. Liquid Surface Treatment Manufacturer's Representative.
 - j. Liquid Surface Treatment Applicator and Polished Floor Surface Installer.
 - k. Joint Filler Manufacturer's Representative.
 - l. Joint Filler Sub-Contractor.

3. Require responsible representatives of each party involved with the concrete slab work to attend the meeting. Representatives to be present shall include personnel who are directly involved in overseeing the work and who have authority to control the concreting work.
4. Contractor to call Structural Engineer two (2) weeks minimum prior to the proposed meeting date in order to finalize meeting date, agenda responsibilities, and other requirements.
5. Notify all required attendees in writing of scheduled time and place at least two weeks in advance of meeting. Include a copy of agenda with invitation. Submit record of notification of pre-slab construction meeting notice and agenda including company name, persons contacted, and date and method of contact.
6. Submit a copy of completed Pre-Slab Construction Meeting Agenda to all proposed meeting attendees at least one (1) week prior to meeting date.
7. Submit meeting minutes and sign-in sheet to all participants and Owner's Project Manager within five (5) days after meeting.

F. Pre-Roof Meeting:

1. Schedule job meeting to review roofing work, prior to actual installation.
2. Attendees will include:
 - a. Owner's Project Manager.
 - b. Contractor's and Project Engineers.
 - c. Contractor's Field Superintendent.
 - d. Contractor's Sub-Contractors supplying items being reviewed. (Roofer, Steel, Sheet Metal, etc.)
 - e. Contractor's Safety Representative.
 - f. Owner's Roofing Inspector.
 - g. Manufacturer's Representative.
3. Agenda:
 - a. Review in detail, manufacturing requirements, specifications, roof plan, deck plan, insulation, roof drainage and flashing details and other work related to roofing. Any anticipated or discovered conflict, incompatibility, or inadequacy shall be reviewed and resolved at the conference.
 - b. Review in detail job conditions, schedule, construction sequence, requirements for application and quality of completed installation, and protection of adjacent Work and property.
 - c. Review in detail means of protecting the completed Work during the remainder of the construction period.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. **INSPECTION OF CONDITIONS:** Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. **MANUFACTURER'S INSTRUCTIONS:** Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- C. Inspect material or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
- E. **VISUAL EFFECTS:** Provide uniform joint widths in exposed work. Arrange joint in exposed work to obtain best visual effect. Refer questionable choices to the Architect for final decision.
- F. Re-check measurements and dimensions before starting each installation.
- G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- I. **MOUNTING HEIGHTS:** Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.
- J. **LIMITING EXPOSURES:** Supervise construction activities to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures shall include, but are not limited to, the following:
 - 1. Excessive static or dynamic loading.
 - 2. Excessive internal or external pressures.
 - 3. Excessively high or low temperatures.
 - 4. Thermal shock.
 - 5. Excessively high or low humidity.
 - 6. Air contamination or pollution.

7. Water and ice.
8. Solvents.
9. Chemicals.
10. Excessive light.
11. Puncture.
12. Abrasion.
13. Heavy traffic.
14. Soiling, staining and corrosion.
15. Bacteria.
16. Rodent and insect infestation.
17. Combustion.
18. Electrical current.
19. High speed operation.
20. Improper lubrication.
21. Unusual wear or other misuse.
22. Contact between incompatible materials.
23. Destructive testing.
24. Misalignment.
25. Excessive weathering.
26. Unprotected storage.
27. Improper shipping or handling.
28. Theft.
29. Vandalism.

K. Millwork/Electrical/IT:

1. See attached Coordination Chart at end of section.

3.2 NOTIFICATION OF ARCHITECT

- A. Notify the Architect at any time there is need of clarification or interpretation of the Contract Documents.
- B. Notify the Architect 48 hours in advance of the following stages of construction:
1. Work areas staked out and batter boards set.
 2. Clearing of work areas.
 3. Stripping of topsoil.
 4. Placement of each lift of select fill material.
 5. Drilling of footings.
 6. Placing of any concrete, including tilt-up panels.
 7. Laying of any masonry.
 8. Placing of paving materials.
 9. City inspection and covering of any underground services.
 10. Completion of roughing in of plumbing, heating, air conditioning and electrical work (prior to concealment).
 11. Roofing and sheet metal work.
 12. Covering of insulation.
 13. Installation of glazing.
 14. Installation of doors.
 15. Completion of fine grading of site.

3.3 CONSTRUCTION OBSERVATIONS

- A. Contractor to call Architect of Record's Project Manager one (1) week prior to the following construction phases:
 - 1. Construction of Panels (if applicable)
 - 2. 75% completion of structural steel package and 50% completion of roof deck.
 - 3. 100% completion of all structural elements and prior to painting.
- B. Contractor to call Structural Engineer two (2) weeks minimum prior to proposed first major interior slab placement date to schedule Structural slab construction observation.
- C. The General Contractor is responsible for coordinating Consultant Inspections with the Architect.
 - 1. The G.C. must give the Architect a minimum of one week's notice prior to the on-site visit and the other consultants a minimum of 72 hours notice.
 - 2. The Sub-Contractor involved in the work (even if it involves more than one trade) must be on site at the time of the review of work.
 - 3. Consultant inspections shall be scheduled as follows:
 - a. Architect – Monthly to review progress & verify payment application.
 - b. Civil Engineer - Review and acceptance of building pad elevation & location prior to any foundation or underground work.
 - c. Civil Engineer – Review of all underground site utilities prior to paving.
 - d. Structural Engineer – Review of foundation work (drilled piers, spread footings etc.) and steel rebar placement associated with these items prior to concrete pour.
 - e. Mechanical Engineer – Review of all under-slab & wall plumbing and rough-in work prior to cover-up.
 - f. Structural Engineer – Review of vapor barrier, steel rebar, expansion joints, etc. installation associated with the concrete slab-on-grade prior to FIRST concrete pour.
 - g. Structural Engineer – Review of steel rebar, steel embeds, etc. installations associated with the concrete tilt-wall panels prior to FIRST concrete pour.
 - h. Structural Engineer – Review of concrete tilt-wall panel placement and anchorage to pier caps prior to back-fill and cover-up of panel bases.
 - i. Structural Engineer – Review of structural steel erection, steel roof framing, and metal roof deck installation.
 - j. Structural Engineer – Review of structural steel once all final connections are made and bracing is in place – before decking is complete.
 - k. Roofing Consultant – Pre-roofing installation meeting. G.C. responsible for coordinating one week prior to commencement of roof installation. Refer to section 075423 in the Project Specifications.
 - l. Electrical Engineer – Review after switchgear is set and conduit/wire installation is underway.
 - m. Mechanical Engineer – Review of all HVAC, fire sprinkler and electrical work in place prior to installation of the suspended acoustical ceiling system.
 - n. Architect – Review of floor slab prep and layout of finish flooring materials prior to installation of finish floor (only as a part of monthly inspection).

- o. Architect/Owner rep. – Scheduled inspection of Architectural Mock-ups, on-site finish samples, critical detail layouts, etc.
 - p. Architect/MEP – Walk-through and punch list prior to issue of “Certificate of Substantial Completion”.
 - q. Architect – Final walk-through and punch list completion inspection just prior to Soft Open.
 - r. Architect – Accessibility inspection/review by an accessibility specialist (in Texas only)
- D. Take Over Projects.
- 1. Site visits during construction: These are prototypical site visits listed and should be revised to meet Academy requirements per location. All walks to be coordinated with GC, Academy CPM and Store Design. Reports for each site visit to be uploaded to Academy online repository with notification of findings to the Academy team.
 - a. **Site Visit 01:** Architectural + MEP – Post demolition walk with GC.
 - b. **Site Visit 02:** Architectural – As built construction compliance walk with associated findings report furnished to Academy 3rd party CPM and Design Manager.
 - c. **Site Visit 03:** Architectural + MEP representative – Completion combined walk. Provide a walk report with pictures and details of findings (AMEP) to be used to the CPM/GC within (3) days of onsite walk. A single MEP representative should accompany the Architect on this walk only, not the full team.
 - d. **Site Visit 04:** Fire Suppression – Completion Walk: Witness Final Acceptance tests of the systems.
 - e. **Site Visit 05:** Civil – Final completion walk: at Soft Opening, site observation to confirm all LL Civil scope has been completed per their plans, if applicable on the project (i.e., addition of truck wells/loading areas.)
- E. Proto/Proto Concept –
- 1. Site visits during Construction: These are prototypical site visits listed and should be revised to meet Academy requirements per location. All walks to be coordinated with GC, Academy CPM and Store Design. Reports for each site visit to be uploaded to Academy online repository with notification of findings to the Academy team.
 - a. **Site Visit 01:** Structural – Onsite Review of foundation. Or alternatively , the Engineer of Record (EOR) accepts the findings of the 3rd party Special Inspections report for review if same.
 - b. **Site Visit 02:** Structural – Onsite Review of Slab Rebar and Vapor Barrier. Or alternatively, the Engineer of Record (EOR) accepts the findings of the 3rd party Special Inspections report for review of same.
 - c. **Site Visit 03:** Civil – Observe site to confirm LLCivil is progressing per LL Civil plans, if Civil teams are on staff. If not, coordinate with Academy’s 3rd party Civil contact, Kimley Horn.
 - d. **Site Visit 04:** Structural – Review of rebar and embeds for tilt wall panels.
 - e. **Site Visit 05:** Structural – Review of Roof Deck, Structural steel, and Tilt wall panel connections.
 - f. **Site Visit 06:** Architectural – As-built construction compliance walk with associated findings report furnished to Academy 3rd party CPM and Design Manager.

1.

- g. **Site Visit 07: Structural** – Review of Final joist and joist girder connections, bridging and kicker braces during structural completion walk.
- h. **Site Visit 08: Architectural + MEP** – Completion combined walk. Provide a walk report with pictures and details of findings (AMEP) to be issued to the CPM/GC within (3) days of onsite walk. A single MEP representative to join the Architect for this walk only, not the full team.
- i. **Site Visit 09: Fire Suppression** – Completion Walk: Witness Final Acceptance tests of the systems.
- j. **Site Visit 10: Civil** – Final completion walk: At Soft Opening, site observe to confirm that all LL Civil scope has been completed per the LL/Developers Civil plans, if Civil teams are on staff. If not, coordinate with Academy's 3rd party Civil contact, Kimley Horn.

Mill Work - Installation (Dressing Room-IDF, Cash Wraps, Cash Out Booth, Managers Booth, Customer Service Counter, Hunt/Fish counter) Time line is based on an ideal install of 4 days, day shift work were all materials arrive on time. If multiple shifts are worked or number of days change, the time line may vary but order of install and electrical work should remain the same.	Number of days after Mill Work install begins (Store Fixture Setup date)
IT Cable Contractor: Store Pre-Wire begins (Speakers, CCTV, AP's, Main cable runs)	-3 to -5 Days
Mill work parts and installers arrive: - parts unloaded Mill Work Installers: - Dressing Room and IDF build begins - Cash Wrap installs begin and should complete - If enough installer crews, then Cash Out and Manager booth, Customer Service, Hunt/Fish counters installs begin in order listed Electricians: - Morning: If not already complete, prepare data/power poles for cash wraps, booths and counters - Afternoon: Begin installing data/power poles at Cash Wraps as each install completes	1
Mill Work Installers: - Morning: If not already completed, Cash Wrap installs complete - Afternoon: Dressing Room and IDF build completes - If not already started, Cash Out and Manager booth, Customer Service, Hunt/Fish counters install begins in order listed Electricians: - Morning: If not already started, begin installing data/power poles at Cash Wraps - Afternoon: Once IDF walls are secure, install 3 data cable conduits in IDF, install 3 IG electrical circuits and dedicated ground in the IDF, in order listed. Then continue installing data/power poles at cash wraps IT Cable Contractor: - Afternoon: Begin dropping cables down data/power poles at the Cash Wraps	2
Mill Work Installers: - Cash Out and Manager booth, Customer Service, Hunt/Fish counters install continues in order listed Electricians: - Morning: If the 3 data cable conduits and other electrical work is not complete in IDF during afternoon of day 2, then this is a priority to complete the morning of day 3 - If not already complete, the Cash Wrap data/power poles installs complete - Begin standing data/power poles at Cash Out and Managers booth and other counters as Mill Work installs complete IT Cable Contractor: - Finishes dropping cables down data/power poles at Cash Wraps and begin work inside the IDF	3
Mill Work Installers: - Cash Out and Manager Booth, Customer Service, Hunt/Fish counters installs should be completing Electricians: - Should be completing data/power pole installs at all booths and counters as Mill Work install completes IT Cable Contractor: - Begin dropping cables down data/power poles as electricians finish installs at all booths and counters	4 +
Electricians: - Once end caps are set, install Data conduit and power for Price Checkers - During and after Mill Work install, make hot all electrical in IDF, Cash Wraps, Cash Out and Manager Booths, Customer Service Counter, Hunt/Fish Counter, Price Checker end caps	5, 6, 7
IT Cable Contractor: - Before, during and after the Mill Work install, IT cabling to non-mill work related areas will be taking place (BOH, Receiving, Support Columns, Ceiling)	

Prepared by: Keith Mallett - Network Engineer - 12/18/12



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Pre-Construction Meeting Agenda

Date: March 6, 2015

Owner/Developer: Name
Address
City, State Zip Code

Project: Store Number
Address/Intersection
City, State Zip Code

Present:

Name:	Company:	Role:	Email:

The following items were discussed or reviewed: (Please note: Meeting Notes issued after this Meeting take precedence over this Meeting Agenda.)



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ACTION REQUIRED	ITEMS
	1. General Info a. Contacts i. Architect ii. AS+O Sign Company iii. AS+O Testing Lab b. Dates – Construction dates are subject to change. Construction Start: Marketing Trailer Drop Off: Hiring Trailer Drop Off: Millwork Installation: Data Installation: Fixture Installation: Merchandise Installation: Hiring Trailer Pick Up: Turnover: Soft Opening: Grand Opening: c. Delivery Type – i. BTS/RBTS/Purchase d. Square Footage – i. Total: ii. Receiving Area: iii. Sales Floor: iv. Back of House: e. Plans and Specifications i. Using “For Construction” Plans and Specifications ii. All plans must be up to date at time of visit by Architects/AS+O CPM. 2. Phasing a. Schedules i. Copy for Design Team ii. Monthly Updates iii. Anticipated cover up dates for electrical and fire sprinkler inspections 3. Critical Work Sequencing and Long Lead Items 4. Designation of Key Personnel and Duties a. Tenant – b. Site Work –



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- c. Building Extents –
 - i. Architect –
 - ii. MEP –
- d. General Contractor -

5. Procedures for Field Decisions and Change Orders

- a. AIA Forms are required. Use most current.
- b. Change Proposal – Will reflect any proposed changes/revisions once approved, several change proposals will be incorporated into a single change order.

6. Procedures for RFI's

- a. To minimize written formal RFIs (request for information), the Contractor should first call or e-mail the Architect. Items that can be solved quickly by phone or e-mail will be done without a formal RFI. If more “in depth” issue comes up, it may be necessary to issue a formal RFI to distribute to affected parties.
- b. All decisions affecting change of scope or cost should be in a RFI format.
- c. Architect to be copied on all RFIs that are sent directly to Consultants.
- d. Subcontractors shall not send RFIs directly to Architect or Engineers.

7. Procedures for Testing and Inspections

8. Procedures for Processing Pay Applications

9. Distribution of Contract Documents

10. Submittal Procedure

11. Preparation of Record Documents

12. Use of the Premises

13. Work Restrictions

14. Working Hours

15. Owner's Occupancy Requirements

16. Responsibility for Temporary Facilities and Controls

17. Procedures for Moisture and Mold Control

18. Procedures for Disruptions and Shutdowns

19. Parking Availability



Architecture Firm Logo

20. Office, Work, and Store Areas

21. Equipment Deliveries and Priorities

22. AS+O Project Misc

1. GC is required to have the same Superintendent on the project for NTP to final completion.
2. GC is to have Superintendent dedicated to AS+O only.
3. GC and staff are to be versed in operation of AS+O project management software. Software is Expesite. Weekly photos, reports, pay applications, etc. are to be uploaded to Expesite for distribution.
4. GC is to comply with local, state and national building codes and safety guidelines for the duration of the AS+O project.
5. GC is to provide jobsite trailer and facilities exclusively for AS+O.
6. Cranes are not allowed on the building slab for panel or steel erection.
7. There will be no value engineering during construction, provide materials and manufacturers specified.
8. CO 2 Sensors are to be mounted at 10'-0" AFF.
9. Co 2 Sensors, electrical devices, T-Stats, and phone boxes are to be mounted on the back side of columns.
10. Take care to use the correct Bradley Sink Model Numbers to avoid ADA issues.
11. Plumbing piping that is insulated is to be insulated all of the way through the wall.
12. Pay particular attention to mounting heights for signage and accessories for ADA compliance.
13. There is to be no pipe cutting for gas line or any other installation on the roof.
14. When building signs are installed, prevent roof damage for spalled concrete.
15. Concrete patch material installed at spalled concrete is to be smooth and flush with the panel surface.
16. GC to use MM80 joint sealer for slab joints in the receiving and fire riser rooms. All other areas are to receive Ardex.
17. Check lighting fixture shipments for damage as they arrive. If fixtures are damaged and not reported upon delivery, GC will be responsible for purchase of replacement fixtures.
18. Check HVAC equipment as it arrives for damage and correct voltage. If equipment is damaged or the voltage is incorrect and not reported upon delivery, GC will be responsible for purchase of replacement equipment.
19. No conduit, sprinkler pipe, communications cabling is to cross below skylight.



Architecture Firm Logo

20. All utilities, piping, wiring, conduit, etc. and to be run between bottom of deck and bottom cord of joists.
21. Position exit lights so they are visible.
22. Install Project Sign at NTP (See Temp Facilities Section).
23. Install Roof Top Equipment Piping so that it does not interfere with equipment operation and access doors.
24. GC to leave attic stock on a wrapped pallet in the Receiving Room.
25. GC is to coordinate touch up painting, tile replacement, etc. for completion the week prior to soft opening.
26. GC is to insure that AS+O and design team are copied on all testing reports.
27. Close out documents and billings are to be completed no later than 30 days after soft opening date.
28. GC is expected to assist the AS+O store management with items such as room identification sign installation, repairs to hiring trailers, general clean and touch up, etc.
29. In the event that Academy's commissioning agent (ENTEK) is called to the site two or more times to verify completion of any system the developer will be responsible for the cost of the additional site visits and expenses.
30. Academy vendors will require full payment within two months of completing their scope of work.
31. Use Lennox exclusively for HVAC
32. Use Antex Roofing exclusively for roofing.
33. Use AS+O preferred vendors as indicated on sheet A-0.2.
34. Discuss the specifications of the Light Poles and Light Pole Bases.

**Note: The above notes reflect the writer's understanding of events, decisions, agreements, etc. If you have any major discrepancies, please notify the writer.*



1540 N. Mason Road – Katy, Texas 77449-

RFAS-(Request for Additional Scope)

DATE

PROJECT NAME

PROJECT NO.

FROM

ACADEMY ☐ ARCHITECT ☐ ENGINEER ☐ CONTRACTOR ☐ RFI# ☐ OTHER ☐

ACADEMY STORE NO. /ARCHITECT/ENGINEER/CONTRACTOR JOB NO/ OTHER

SUBJECT:

REFERENCES: A. SPECIFICATIONS B. DRAWINGS

REQUEST:

The above subject/item as more specifically addressed below DOES NOT appear in the referenced documents or project scope as part of the work and requires immediate action to clarify, and or be added to the documents.

(Parties/ Signature)

Approved BY CONSTRUCTION:
(Parties/ Signature)

APPROVED BY DESIGN
(Parties/ Signature)

ADDITIONAL COMMENTS/RESPONSE:

By: Company: Date:



1540 N. Mason Road – Katy, Texas 77449-

RFI

NO.

DATE
PROJECT NAME
PROJECT NO.
FROM

CONTRACTOR ☐ ACADEMY ☐ ARCHITECT ☐ ENGINEER ☐ RFI-(PRIOR) ☐ OTHER ☐

ACADEMY STORE NO./CONTRACTOR JOB NO/ OTHER

SUBJECT:

REFERENCES: A. SPECIFICATIONS B. DRAWINGS

REQUEST:

The above subject as more specifically addressed below appears in the referenced documents as part of the work and requires a clarified interpretation for our complete understanding of the intent of the documents.

(Parties/ Signature)

RESPONSE:

By: Company: Date:

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Weekly "Construction Project Data" sheets.
 - 3. Daily construction reports.
 - 4. Site condition reports.
 - 5. Daily time-lapse camera construction monitoring system.

1.2 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file.
 - 2. Three paper copies.
 - a. Architect/Engineer will review schedules and return review copy within ten days after receipt.
 - b. If required, resubmit within seven days after return of review copy.
- B. Construction Schedule Updating Reports: Submit with Applications for Payment.
- C. Site Condition Reports: Submit at time of discovery of differing conditions.

1.3 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 15 days of date established for the Notice to Proceed.
 - 1. Separate horizontal bar column for each trade or operation.
 - 2. Chronological order of beginning of each item of work.
 - 3. Identify each column by distinct graphic delineation.
 - 4. Horizontal Time Scale: Identify the first workday of each week.
 - 5. Scale and Spacing: Allow spacing for updating.
 - 6. Sheet Size: 8-1/2 inches x 11 inches.

2.2 CONTENT OF SCHEDULES

- A. Provide complete sequence of construction activity. Identify each item by listing according to Schedule of Values.
 - 1. Drawings, Product Data and Samples:
 - a. Submittal dates.
 - b. Dates reviewed copies will be required.
 - 2. Decision Dates For:
 - a. Products specified by allowances.
 - b. Selection of finishes.
 - 3. Product procurement and delivery dates.
 - 4. Dates for beginning, and completion of, each element of construction, including but not limited to, the following:
 - a. Concrete placement.
 - b. Subcontractor work.
 - c. Equipment installations.
 - d. Equipment tests.
- B. Identify Work of separate phases.
- C. Show projected percentage of completion for each item of Work as of first day of each month.
- D. Provide sub-schedules to define critical portions of the entire schedule.

2.3 WEEKLY "CONSTRUCTION PROJECT DATA" SHEETS

- A. The "Construction Project Data" sheet will contain the information illustrated in the sample form behind this section. It is an Excel spreadsheet form available from the Architect of Record or the Academy CPM.
- B. The "Construction Project Data" sheet will be completed weekly and uploaded to Academy's Project Management Web Site in folder "E06.a – Weekly Reports" in addition to weekly photos.

2.4 DAILING TIME-LAPSE VIDEO MONITORING & ONLINE VIEWING

- A. The Contractor shall provide a video time-lapse monitoring camera (1) with online access service, 4-month lease vendor service contract including the following:
 - 1. High resolution photos every 10 minutes – 8 MP camera.
 - 2. Activity and Safety Analysis powered by Artificial Intelligence (AI).
 - 3. Proactive Camera Management by dedicated client support manager.
 - 4. Hosting and image archiving by vendor.
 - 5. Website integration.
 - 6. Automated photo and time-lapse reports.
 - 7. Universal mount for pole, wall or parapet.
 - 8. Professional 1080p time-lapse movie production.
- B. Manufacturer / Vendor & Product:
 - 1. OxBlue – Cobalt Series fixed position cellular camera.
 - 2. Contact: Melissa Wesselschmidt, Enterprise Account Executive
 - a. Ph: 404-400-7616 direct
 - b. Ph: 888-849-2583 main
 - c. Email: mwesselschmidt@oxblue.com
- C. Substitutions not allowed.
- D. GC to provide two articulating OxBlue Cobalt fixed-position construction camera locations for the duration of the construction process, in accordance with the pre-established package setup with OxBlue. Mount one construction camera opposite the Hunting Counter corner and adjust to provide view of entire Sales Floor. Mount one construction-camera outside of the building, at the highest elevated position possible, and adjust to provide a view of the entire front building facade.
- E. Contractor to coordinate and provide temporary data and power hookups as required (inclusive of solar options, if necessary).

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule three days before each regularly scheduled progress meeting.
 - 1. Show all changes occurring since previous submission of updated schedule.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to:
 - a. Major changes in scope.
 - b. Activities modified since previous updating.
 - c. Revised projections due to changes.
 - d. Other identifiable changes.
- B. Descriptions of Revisions
 - 1. Effect of schedule due to change of scope.
 - 2. Revisions in duration of activities.
 - 3. Other changes that may affect the schedule.
- C. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

[illegible]



Store Design Department

Date: 02-03-2020

Construction Project Data Process/Procedures:

Weekly Form for Store as assigned by AOR for selected GC to maintain throughout the course of the store project build schedule.

ALL General Contractors to send out up-dated ASO weekly report and form as a clarification of requirements to be followed per the specifications going forward.

- The objective being to create an initial **“Construction Project Data”** standard sheet per the requirements as set in our master specifications for each store project.
- Per Academy Sports + Outdoors standard specifications we will then require weekly update of the **“Construction Project Data”** sheet for each store project. As it relates to your assigned store project job schedule/timeline for build out by General Contractor.
- These updated weekly reports will then need to be up-loaded to Academy's Project Management Web Site in appropriate Store Project folder document file “along with required weekly photos. (Refer to below screen shot for location in Academy's Project Management Web Site.)

Academy Sports + Outdoors
Powered By expsite

My Desktop My Projects Dashboard

TN - Johnson City (#235) (Under Construction) BTS

Project Home Unsubscribe

Documents | Project Info | Team | Project History | Project Tasks | Milestones | Budget

Project Documents ▶ E06.a - Daily Reports

Summary Report

Download Folder

- Week #14(10)
- Week #15(33)
- Week #16(19)
- Week #17(22)
- Week #18(19)
- Week #19(51)
- Week #20(19)
- Week #21(23)
- Week #22(0)
- Week #23(0)
- Week #24(0)
- Week #25(0)
- Week #26(0)
- E02 - Budget(0)
- E02.a - Costing Report(0)
- E03 - Construction Contract(0)
 - E03.a - Request for Information (RFI)(0)
 - E03.b - Construction Addenda(0)
 - E03.c - Change Orders(0)
 - E03.d - Statement of Work (SOW)(9)
 - E03.e - Request for Proposal (RFP)(0)
 - E03.f - Pay Applications / Invoices(0)
 - E03.g - Subcontractors(0)
 - E03.h - Cert of Substantial Completion(0)
 - E03.i - Affidavit of Completion(0)
- E04 - CMT(3)
- E05 - Schedules(0)
- E06 - Bi-Weekly Site Inspections(3)
- E06.a - Daily Reports(21)**

E06.a - Daily Reports Thumbnail view

Title	Markups Posted By	Date	Size (KB)	Version
☐ Select All				
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 1-03-14.xls	Bobby Boatwright	1/3/2015	490	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 1-11-15.xls	Bobby Boatwright	1/11/2015	606	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 1-17-15.xls	Tyler Wright	1/17/2015	406	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 1-23-15.xls	Tyler Wright	1/25/2015	407	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 1-29-15.xls	Tyler Wright	2/1/2015	687	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 11-14-14.xls	Bobby Boatwright	11/14/2014	672	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 11-21-14.xls	Bobby Boatwright	11/24/2014	929	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 11-28-14.xls	Bobby Boatwright	11/28/2014	625	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 12-06-14.xls	Bobby Boatwright	12/6/2014	485	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 12-13-14.xls	Bobby Boatwright	12/13/2014	587	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 12-19-14.xls	Bobby Boatwright	12/19/2014	522	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 12-28-14.xls	Bobby Boatwright	12/28/2014	398	1
☐ ACADEMY Johnson City, TN TDF 2604 Weekly Report 2-08-15.xls	Tyler Wright	2/8/2015	718	1

File E06.a-"Daily Reports"

Note: this folder to be re-named "Weekly" in up-coming weeks.

- Architects will distribute to all current GC's, as well as pass out during Pre-Cons to the GC's, and review an electronic copy to be sent to GC. For initial start and for them to maintain and upload weekly during project construction schedule.
- Please note form conception and relevance based on Store Project Type as per Academy Sports + Outdoors typical models; BTS, RBTS, and Purchases.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 2. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 3. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 - 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.

- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 7 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 7 days for review of each resubmittal.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.

- i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
- E. Options: Identify options requiring selection by Architect.
 - F. Deviations: Identify deviations from the Contract Documents on submittals.
 - G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
 - H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
 - I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements:
 - 1. Post electronic submittals as PDF electronic files directly to Project Web site and Architect's FTP site specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.

- c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
- 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 - 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Coordination Drawings Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- F. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- J. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

- O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- T. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with Statement of Certification as specified below before submitting to Architect.
1. "I hereby submit this Shop Drawing has been checked prior to submittal to the Architect and it complies in all respects, except as noted, with the requirement of the Contract Documents and physical space limitations on the job."

Contractor Name

Position

Signature

Date

- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

3.2 MANUFACTURER'S STATEMENT OF CERTIFICATION

- A. Submittals for materials and equipment listed in Divisions 21, 22, 23, 26,27, and 28 entitled "Schedule of Submittal Data" and shown with asterisks (*), shall be certified as to performance and compliance with the Contract Documents by the manufacturer prior to submittal. Certifications shall be made only by a corporate officer of the manufacturer, or other person duly authorized to sign for the corporation. Submittals of materials and equipment designated which are not properly certified by the manufacturer and Contractor will not be reviewed by the Architect and will be returned to the Contractor for proper certification and resubmittal. The manufacturer's certification shall be as follows:

"We hereby certify that the equipment shown on this Shop Drawing complies in all respects, except as noted, with the requirements of the Contract Documents for this Project. We further certify that all data shown herein as to performance, dimensions, construction, materials and other pertinent items are true and correct."

Manufacturer's Name

Signature of Mfr's Agent

Date

Position of Mfr's Agent

3.3 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SUBMITTAL LOG

Start Date:

Project: City, ST

Project Manager:

Project Number: XXXXXX

Contractor:

Submittal Number	Section Name Submittal Item	Shop Drawings	Product Data	Dwg/Spec Verification	Date Received	Number of Copies Received	Sub-Contractor Trade	Referred Consultant				Action				Date Returned to Contractor	Copies To		
								Sent To	Date Sent	Number Returned	Date Returned to Arch.	No Exceptions	Exceptions Noted	Revise Resubmit	Rejected		Contractor	Owner	File
Div. 03	Concrete																		
03-02	Concrete Reinforcement	X																	
03-03	Cast in Place Concrete	X	X																
03-05	Concrete Floor Finishing		X																
03-06	Concrete Curing		X																
03-07	Tilt-Up Precast Concrete	X	X																
Div. 04	Masonry			X															
Div. 05	Metals																		
05-01	Structural Steel	X																	
05-02	Steel Joist & Girders	X																	
05-03	Steel Roof Deck	X	X																
Div. 06	Wood and Plastics			X															
Div. 07	Thermal and Moisture Prot.																		
07-03	Exterior Insulation & Finish Sys.		X																
07-05	Roofing Materials		X																
07-06	Gutters & Downspouts		X																
07-07	Skylights	X	X																
07-08	Roof Hatch		X																
07-09	Joint Sealers			X															
Div. 08	Openings																		
08-01	Steel Doors	X	X																
08-02	Steel Frames	X	X																
08-03	Coiling Overhead Doors	X	X																
08-04	Folding Gates			X															
08-05	Impact Doors		X																

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 GENERAL

2.01 SECTION INCLUDES

- A. Testing and inspection agencies and services.
- B. Control of installation.
- C. Defect Assessment.

2.02 RELATED REQUIREMENTS

- A. Section 014216 - Definitions.

2.03 TESTING AND INSPECTION AGENCIES AND SERVICES

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.

3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.03 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 014216 – DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- E. Provide: To furnish and install.
- F. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 014219 - REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements relating to referenced standards.
- B. Reference standards full title and edition date.

1.02 QUALITY ASSURANCE

- A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
- C. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

PART 2 CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

2.01 AA -- ALUMINUM ASSOCIATION, INC.

2.02 AABC -- ASSOCIATED AIR BALANCE COUNCIL

2.03 AAMA -- AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION

- A. AAMA 606.1 - Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum; 1976.
- B. AAMA 607.1 - Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes For Architectural Aluminum; 1977.
- C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- D. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- E. AAMA 612 - Voluntary Specification, Performance Requirements, and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2020, with Errata (2022).

- 2.04 AASHTO -- AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
- 2.05 AATCC -- AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS
- 2.06 ABMA -- AMERICAN BEARING MANUFACTURERS ASSOCIATION, INC.
- 2.07 ACA -- AMERICAN COATINGS ASSOCIATION
- 2.08 ACG -- AABC COMMISSIONING GROUP
- 2.09 ACI -- AMERICAN CONCRETE INSTITUTE INTERNATIONAL
- 2.10 ACMA -- AMERICAN COMPOSITES MANUFACTURERS ASSOCIATION
- 2.11 ADC -- AIR DIFFUSION COUNCIL
- 2.12 AEIC -- ASSOCIATION OF EDISON ILLUMINATING COMPANIES
- 2.13 AFPA -- AMERICAN FOREST AND PAPER ASSOCIATION
- 2.14 AGA -- AMERICAN GALVANIZERS ASSOCIATION, INC.
- 2.15 AGC -- ASSOCIATED GENERAL CONTRACTORS OF AMERICA
- 2.16 AHAM -- ASSOCIATION OF HOME APPLIANCE MANUFACTURERS:
- 2.17 AHRI -- AIR-CONDITIONING, HEATING, AND REFRIGERATION INSTITUTE
- 2.18 AI -- THE ASPHALT INSTITUTE
- 2.19 AIA -- THE AMERICAN INSTITUTE OF ARCHITECTS
- 2.20 AISC -- AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.
- 2.21 AISI -- AMERICAN IRON AND STEEL INSTITUTE
- 2.22 AIST -- ASSOCIATION FOR IRON AND STEEL TECHNOLOGY
- 2.23 AITC -- AMERICAN INSTITUTE OF TIMBER CONSTRUCTION
- 2.24 ALI -- AMERICAN LADDER INSTITUTE
- 2.25 ALSC -- AMERICAN LUMBER STANDARDS COMMITTEE
- 2.26 AMCA -- AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.
- 2.27 ANSI -- AMERICAN NATIONAL STANDARDS INSTITUTE
- 2.28 APA -- APA - THE ENGINEERED WOOD ASSOCIATION
- 2.29 APHA -- AMERICAN PUBLIC HEALTH ASSOCIATION
- 2.30 API -- ALLIANCE FOR THE POLYURETHANES INDUSTRY, AMERICAN PLASTICS COUNCIL
- 2.31 ARI -- AIR-CONDITIONING AND REFRIGERATION INSTITUTE (SEE AHRI)
- 2.32 ARRA -- ASPHALT RECYCLING AND RECLAIMING ASSOCIATION
- 2.33 ASA -- ACOUSTICAL SOCIETY OF AMERICA
- 2.34 ASCA -- ARCHITECTURAL SPRAY COATERS ASSOCIATION
- 2.35 ASCE -- AMERICAN SOCIETY OF CIVIL ENGINEERS
- 2.36 ASHRAE -- AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC.
- 2.37 ASME -- THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
- 2.38 ASPE -- AMERICAN SOCIETY OF PLUMBING ENGINEERS
- 2.39 ASSE -- AMERICAN SOCIETY OF SANITARY ENGINEERING
- 2.40 ASTM A SERIES -- ASTM INTERNATIONAL

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

2.41 ASTM B SERIES -- ASTM INTERNATIONAL

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

2.42 ASTM C SERIES -- ASTM INTERNATIONAL

2.43 ASTM D SERIES -- ASTM INTERNATIONAL

2.44 ASTM E SERIES -- ASTM INTERNATIONAL

2.45 ASTM F SERIES -- ASTM INTERNATIONAL

2.46 ASTM SYMPOSIA AND SELECTED TECHNICAL PAPERS -- ASTM INTERNATIONAL

2.47 AWC -- AMERICAN WOOD COUNCIL

- A. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.

- 2.48 AWCI -- ASSOCIATION OF THE WALL AND CEILING INDUSTRIES INTERNATIONAL
- 2.49 AWI -- ARCHITECTURAL WOODWORK INSTITUTE
- 2.50 AWMAC/WI -- JOINT PUBLICATION OF ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA/WOODWORK INSTITUTE
- 2.51 AWPA -- AMERICAN WOOD-PRESERVERS' ASSOCIATION
- 2.52 AWPB -- AMERICAN WOOD PRESERVERS BUREAU
- 2.53 AWS -- AMERICAN WELDING SOCIETY
- 2.54 AWWA -- AMERICAN WATER WORKS ASSOCIATION
- 2.55 BHMA -- BUILDERS HARDWARE MANUFACTURERS ASSOCIATION
- 2.56 BIA -- BRICK INDUSTRY ASSOCIATION
- 2.57 BICSI -- BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL
- 2.58 BOMA -- BUILDING OWNERS AND MANAGERS ASSOCIATION
- 2.59 CDA -- COPPER DEVELOPMENT ASSOCIATION, INC.
- 2.60 CEA -- CONSUMER ELECTRONICS ASSOCIATION
- 2.61 CFSEI - COLD-FORMED STEEL ENGINEERS INSTITUTE
- 2.62 CGA -- COMPRESSED GAS ASSOCIATION
- 2.63 CISCA -- CEILINGS & INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION
- 2.64 CISPI -- CAST IRON SOIL PIPE INSTITUTE
- 2.65 CLFMI -- CHAIN LINK FENCE MANUFACTURERS INSTITUTE
- 2.66 CPA -- COMPOSITE PANEL ASSOCIATION
- 2.67 CRI -- CARPET AND RUG INSTITUTE
- 2.68 CRRC -- COOL ROOF RATING COUNCIL
- 2.69 CRSI -- CONCRETE REINFORCING STEEL INSTITUTE
- 2.70 CSA -- CSA GROUP (FORMERLY CSA INTERNATIONAL)
- 2.71 CTA -- CONSUMER TECHNOLOGY ASSOCIATION (FORMERLY CONSUMER ELECTRONICS ASSOCIATION)
- 2.72 CTI -- COOLING TECHNOLOGY INSTITUTE
- 2.73 DASMA -- DOOR & ACCESS SYSTEMS MANUFACTURERS' ASSOCIATION, INTERNATIONAL
- 2.74 DBIA -- THE DESIGN BUILD INSTITUTE OF AMERICA, INC.
- 2.75 DFI -- DEEP FOUNDATION INSTITUTE
- 2.76 DHI -- DOOR AND HARDWARE INSTITUTE
- 2.77 DIPRA - DUCTILE IRON PIPE RESEARCH ASSOCIATION
- 2.78 EIA -- ELECTRONIC INDUSTRIES ALLIANCE
- 2.79 EIA -- ENVIRONMENTAL INDUSTRY ASSOCIATION
- 2.80 EIMA -- EXTERIOR INSULATION MANUFACTURERS ASSOCIATION
- 2.81 EJMA -- EXPANSION JOINT MANUFACTURERS ASSOCIATION
- 2.82 FLA -- STATE OF FLORIDA
- 2.83 FM -- FACTORY MUTUAL GLOBAL
 - A. FM Global Office Contact
 - B. Dallas Office
 - C. One Cowboys Way

- D. Suite 600
- E. Frisco, TX 75034
- F. Main Phone No. 972 377 4808
- G. Lead Plan Review Desk
- H. Generic E-mail address: ENGDallasPlanReview@fmglobal.com

- 2.84 GA -- GYPSUM ASSOCIATION
- 2.85 GANA -- GLASS ASSOCIATION OF NORTH AMERICA
- 2.86 GRI -- GEOSYNTHETIC RESEARCH INSTITUTE
- 2.87 HI -- HYDRAULIC INSTITUTE
- 2.88 HI -- THE HYDRONICS INSTITUTE (SEE AHRI)
- 2.89 HPVA -- HARDWOOD PLYWOOD VENEER ASSOCIATION
- 2.90 IAPMO -- INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS
- 2.91 IAS -- INTERNATIONAL ACCREDITATION SERVICE
- 2.92 ICBO -- INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS
- 2.93 ICBO-ES -- ICBO EVALUATION SERVICE, INC.
- 2.94 ICC -- INTERNATIONAL CODE COUNCIL, INC.
- 2.95 ICC-ES -- ICC EVALUATION SERVICE, INC.
- 2.96 ICPI -- INTERLOCKING CONCRETE PAVEMENT INSTITUTE
- 2.97 ICRI -- INTERNATIONAL CONCRETE REPAIR INSTITUTE
- 2.98 IEC -- INTERNATIONAL ELECTROTECHNICAL COMMISSION
- 2.99 IEEE -- INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
- 2.100 IES/IESNA -- ILLUMINATING ENGINEERING SOCIETY
- 2.101 IETF -- INTERNET ENGINEERING TASK FORCE
- 2.102 IGMA -- INSULATING GLASS MANUFACTURERS ALLIANCE
- 2.103 IGSHPA -- INTERNATIONAL GROUND SOURCE HEAT PUMP ASSOCIATION
- 2.104 ILI -- INDIANA LIMESTONE INSTITUTE OF AMERICA, INC.
- 2.105 IMIAWC -- INTERNATIONAL MASONRY INDUSTRY ALL-WEATHER COUNCIL
- 2.106 ISA -- INSTRUMENT SOCIETY OF AMERICA
- 2.107 ISDI -- INSULATED STEEL DOOR INSTITUTE
- 2.108 ISFA - INTERNATIONAL SURFACE FABRICATORS ASSOCIATION
- 2.109 ISS -- IRON AND STEEL SOCIETY
- 2.110 ISSFA - INTERNATIONAL SOLID SURFACE FABRICATORS ASSOCIATION
- 2.111 ISO -- INTERNATIONAL STANDARDS ORGANIZATION
- 2.112 ITU-T -- INTERNATIONAL TELECOMMUNICATIONS UNION -TELECOMMUNICATION STANDARDIZATION SECTOR
- 2.113 IWBI -- INTERNATIONAL WELL BUILDING INSTITUTE
- 2.114 KCMA -- KITCHEN CABINET MANUFACTURERS ASSOCIATION
- 2.115 LPI -- LIGHTNING PROTECTION INSTITUTE
- 2.116 MFMA -- METAL FRAMING MANUFACTURERS ASSOCIATION
- 2.117 MPI -- MASTER PAINTERS INSTITUTE (MASTER PAINTERS AND DECORATORS ASSOCIATION)
- 2.118 MSS -- MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY, INC.
- 2.119 NAA -- NATIONAL ARBORIST ASSOCIATION
- 2.120 NAAMM -- THE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS
- 2.121 NACE -- NACE INTERNATIONAL
- 2.122 NADCA -- NATIONAL AIR DUCT CLEANING ASSOCIATION

2.123	NAMM -- NATIONAL ASSOCIATION OF MIRROR MANUFACTURERS
2.124	NBI -- NEW BUILDINGS INSTITUTE
2.125	NCWPB - NATIONAL CERTIFIED PIPE WELDING BUREAU
2.126	NEBB -- NATIONAL ENVIRONMENTAL BALANCING BUREAU
2.127	NECA -- NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION
2.128	NELMA -- NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION, INC.
2.129	NEMA -- NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
2.130	NETA -- INTERNATIONAL ELECTRICAL TESTING ASSOCIATION
2.131	NFPA -- NATIONAL FIRE PROTECTION ASSOCIATION
2.132	NFRC -- NATIONAL FENESTRATION RATING COUNCIL, INC.
2.133	NGA -- NATIONAL GLASS ASSOCIATION
2.134	NIBS -- NATIONAL INSTITUTE OF BUILDING SCIENCES
2.135	NPCA -- NATIONAL PAINT AND COATINGS ASSOCIATION
2.136	NRCA -- NATIONAL ROOFING CONTRACTORS ASSOCIATION
2.137	NRMCA -- NATIONAL READY MIXED CONCRETE ASSOCIATION
2.138	NSI -- NATURAL STONE INSTITUTE
2.139	PCA -- PORTLAND CEMENT ASSOCIATION
2.140	PDCA -- PAINTING AND DECORATING CONTRACTORS OF AMERICA
2.141	PDI -- PLUMBING AND DRAINAGE INSTITUTE
2.142	PPI -- PLASTICS PIPE INSTITUTE
2.143	RCSC -- RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS
2.144	RFCI -- RESILIENT FLOOR COVERING INSTITUTE
2.145	SAE -- SAE INTERNATIONAL
2.146	SBCA -- STRUCTURAL BUILDING COMPONENTS ASSOCIATION
2.147	SBCCI -- SOUTHERN BUILDING CODE CONGRESS INTERNATIONAL, INC.
2.148	SCAQMD -- SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
2.149	SDI -- STEEL DECK INSTITUTE
2.150	SDI -- STEEL DOOR INSTITUTE
2.151	SJI -- STEEL JOIST INSTITUTE
2.152	SMA -- SCREEN MANUFACTURERS ASSOCIATION
2.153	SMACNA -- SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC.
2.154	SPIB -- SOUTHERN PINE INSPECTION BUREAU, INC.
2.155	SPRI -- SINGLE PLY ROOFING INDUSTRY
2.156	SSPC -- SOCIETY FOR PROTECTIVE COATINGS
2.157	STI -- STEEL TANK INSTITUTE
2.158	SWI -- STEEL WINDOW INSTITUTE
2.159	SWRI -- SEALANT, WATERPROOFING AND RESTORATION INSTITUTE
2.160	TCNA -- TILE COUNCIL OF NORTH AMERICA, INC.
2.161	TIA -- TELECOMMUNICATIONS INDUSTRY ASSOCIATION
2.162	TMS -- THE MASONRY SOCIETY

- 2.163 TPI -- TRUSS PLATE INSTITUTE
- 2.164 TPI -- TURFGRASS PRODUCERS INTERNATIONAL
- 2.165 UL -- UNDERWRITERS LABORATORIES INC.
- 2.166 USGBC -- U.S. GREEN BUILDING COUNCIL

PART 3 UNITED STATES GOVERNMENT AND RELATED AGENCIES DOCUMENTS

- 3.01 CEQ -- COUNCIL ON ENVIRONMENTAL QUALITY GUIDANCE
- 3.02 CFR -- CODE OF FEDERAL REGULATIONS
- 3.03 COE -- CORPS OF ENGINEERS, U.S. ARMY
- 3.04 CPSC -- CONSUMER PRODUCTS SAFETY COMMISSION
- 3.05 DOS -- UNITED STATES DEPARTMENT OF STATE
- 3.06 EPA -- ENVIRONMENTAL PROTECTION AGENCY
- 3.07 FEMA -- U.S. FEDERAL EMERGENCY MANAGEMENT AGENCY
- 3.08 FS -- FEDERAL SPECIFICATIONS AND STANDARDS (GENERAL SERVICES ADMINISTRATION)
- 3.09 GSA -- U.S. GENERAL SERVICES ADMINISTRATION
- 3.10 MIL -- MILITARY SPECIFICATIONS AND STANDARDS
- 3.11 NIJ -- NATIONAL INSTITUTE OF JUSTICE (DEPT. OF JUSTICE)
- 3.12 PS -- PRODUCT STANDARDS
- 3.13 USAB -- UNITED STATES ACCESS BOARD

END OF SECTION

SECTION 014533 - CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Code or Building Code: ICC (IBC), International Building Code, most recent edition adopted by authority having jurisdiction, including all applicable amendments and supplements without limitation, and specifically Chapter 17 - Special Inspections and Tests.
- B. Special Inspections and Tests: Inspections and testing of materials, installation, fabrication, erection, or placement of components and connections mandated by Building Code to safeguard public welfare.
 - 1. Special inspections and tests are separate from and independent of tests and inspections conducted by Owner or Contractor for purposes of quality assurance and contract administration.

1.02 REFERENCE STANDARDS

- A. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.
- B. IAS AC291 - Accreditation Criteria for Special Inspection Agencies AC291; 2023.
- C. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

1.04 QUALITY ASSURANCE

- A. Special Inspection Agency Qualifications:
 - 1. Independent firm specializing in performing testing and inspections of the type specified in this section.
 - 2. Accredited by IAS according to IAS AC291.
- B. Testing Agency Qualifications:
 - 1. Independent firm specializing in performing testing and inspections of the type specified in this section.
 - 2. Accredited by IAS according to IAS AC89.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SPECIAL INSPECTIONS AND TESTING

- A. The Code requires special inspections and testing of certain materials, components, assemblies, and connections used in constructing the project. Special inspections and testing will be performed in accordance with the Code.

END OF SECTION

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- B. General Contractor shall be responsible for paying for all utility usage prior to turnover.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.
- C. Wood Enclosure Fence: Plywood, 6 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

2.2 SECURITY

- A. Watchmen: Determine if and when watchmen are necessary for protection of the Work, and provide such services when necessary. Neither the provision of watchmen nor the failure to provide watchmen shall relieve the Contractor of responsibility in event of injury to persons or damage to property.

2.3 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.
- C. Temporary Enclosure: Provide temporary enclosure where temporary heat is needed and permanent building enclosure is neither yet completed nor adequate for containment of temporary heat. Coordinate temporary enclosures with ventilating and drying-of-the-work requirements.
 - 1. Where temporary wood/plywood enclosure exceeds 100 square feet in area, use fire-retardant treated wood/plywood (UL labeled "A") for main sheathing, and use a minimum of non-treated wood framing and trim.
- D. Storage and Fabrication Sheds (if allowed by Developer): Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.4 HIRING TRAILERS

- A. General: The General Contractor shall lease and provide two (2) on-site 12'x56' trailers for Owner's (Academy's) use.

1. Alternate hiring location shall be an off-site trailer meeting the same qualifications listed for on-site trailer, hotel, civic center, nearby storefront, or other nearby office location. Location to be approved by owner.
2. Power, heat, and air conditioning must be made available to alternate space, to be furnished by the developer/GC.
3. In Build to Suit sites - alternate hiring location space shall be a minimum of three (3) rooms consisting of a large reception area and two (2) interview rooms. All rooms to be as large as hiring trailer rooms or larger.
4. Telephone, computer, internet connections, and all facilities are to be greater than or equal to the qualifications for hiring trailer.
5. Area signage must be provided to direct applicants to the alternate hiring location.
6. Banner signage must be provided outside the alternate hiring location.
7. Alternate hiring location facilities to be provided for a length of time not less than the time required for hiring trailers in this specification.
8. Accessible restroom facilities must be provided at alternate hiring location consisting of one men's, one women's, with an ambulatory bathroom available.
9. Alternate hiring location must be fully accessible and comply with all ADA accessibility requirements.
10. Adequate offices and restrooms to be provided for alternate hiring location.
11. Location to be maintained and repaired as necessary by GC during the entire term of use.

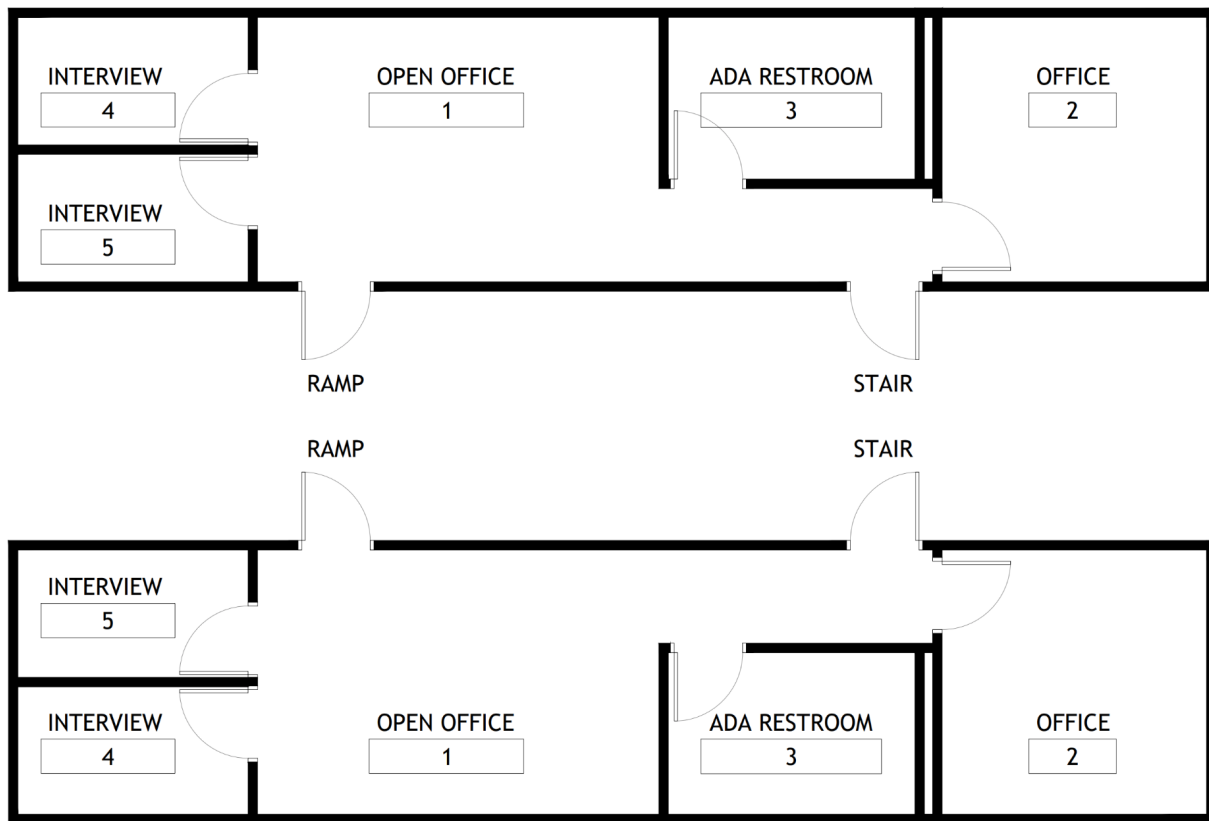
B. The trailers shall be on-site fifteen (15) weeks prior to merchandise date and remain until (5) weeks prior to the store Grand Opening. All costs for the trailers, power and phone lines shall be included in General Contractor's contract. Owner (Academy) shall reimburse the Contractor for any long distance and local phone service costs.

1. The General Contractor shall coordinate with the Owner's (Academy) Project Manager for a location on site to locate the hiring trailers.
2. Contractor shall provide trailers with unisex ADA accessible toilet facilities, (1) in each. The contractor shall keep these restrooms clean at all times to the satisfaction of the Project Manager.
3. Location to be maintained and repaired as necessary by GC during the entire term of use.

C. Each temporary office (trailer) shall meet the following criteria:

1. 12' x 56' trailers with two (2) access doors.
2. Provide heavy-duty bars on the windows and door. Do not install the wire mesh type. Provide bars or expanded metal screens bolted to the structure with straps and padlocks on the doors.
3. One (1) set of stairs.
4. Contractor shall provide, so that the hiring trailer is handicap accessible and so that furnishings within accommodate handicapped applicants and provide one (1) ADA compliant accessible ramp to serve one of the entrances.
5. Temporary offices shall be available and located on the job site per the direction of the Owner/Tenant Construction Manager.
6. Contractor shall coordinate all permitting requirements with local authorities. Contractor shall provide temporary facilities for a duration of time indicated by Owner/Tenant. Contractor shall remove temporary facilities at direction of Owner/Tenant and clean/repair adjacent site area.

7. Power, heat, and air conditioning must be made available to hiring trailer, to be furnished by the developer/GC.
8. The restroom shall be accessible and meet current ADA guidelines including clear floor areas, door clearances, restroom fixtures and accessories.
9. Exterior cladding to be aluminum or wood siding.
10. Structural frame to be steel I-beam frame.
11. Trailer to have standard drip rain gutters and downspouts – direct drainage away from sidewalks.
12. Interior finishes to be paneled walls, carpet or vinyl tile flooring with a gypsum board or suspended acoustical tile ceiling.
13. Lighting to be fluorescent ceiling lights.
14. Provide breaker panel along restroom corridor wall.
15. Provide the following trailer floor plan layout:



D. Hiring Trailer Temporary Power Distribution

1. General: Provide a weatherproof, grounded, temporary power distribution system to accommodate performance of entire work of project, including but not necessarily limited to use of tools, equipment and electrical construction machines, operation of test equipment and test operation of building equipment and systems which cannot be delayed until permanent power connections are operable, temporary operation of other temporary facilities including permanent equipment and systems which must be placed in operation prior to use of permanent power connections (pumps, HVAC equipment, elevators, and similar equipment). Run

circuit wiring overhead and rise vertically in locations where it will be least exposed to possible damage from construction operations and result in least interference with performance of the work. Provide rigid steel conduit for wiring that must be exposed on grade, floors, decks or other recognized exposures to damage or abuse. Provide overload-protected disconnect switch for temporary power distribution center. If temporary power is unavailable, the GC shall include a generator sufficient in size to power both trailers, 24 hours per day.

2.5 DUMPSTER AND TRASH REMOVAL

- A. Contractor shall provide, for use by Owner, a forty (40) yard dumpster from Date of Substantial Completion (turnover date) until store Grand Opening Date. Dumpster shall be emptied once per week minimum, or when dumpster is full, at Contractor's cost.

2.6 EQUIPMENT

- A. Fire Extinguishers (Building and Hiring Trailer): Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment (Building): Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 1. Install electric power service overhead or underground as required by local AHJ.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Telephone Service (Field Office): Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.
 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.

- b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Developer's office
 - i. Principal subcontractors' field and home offices.
 - 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access project electronic documents and maintain electronic communications. Equip computer with not less than the following:
- 1. Processor: 11th Gen Intel(R) Core™ i7-1185g7 @ 3.0 GHz processing speed.
 - 2. Memory: 8 gigabyte.
 - 3. Disk Storage: 1 Terabyte hard-disk drive and combination DVD-RW/CD-RW drive.
 - 4. Display: 22-inch LCD monitor.
 - 5. Network Connectivity: 1000Base-T Ethernet.
 - 6. Productivity Software:
 - a. Microsoft Office 360 or higher, including Word, Excel, and Outlook.
 - b. Adobe Acrobat Reader 25.0 or higher.
 - c. WinZip 29.0 or higher.
 - 7. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
 - 8. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 50Mbps upload and 100Mbps download speeds at each computer.
 - 9. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
- 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is non-polluting and non-tracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Recondition base after temporary use, including removing contaminated material, regrading, proof rolling, compacting, and testing.
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Provide temporary parking areas for construction personnel.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated below.
 - a. Size: 8 ft. wide x 4 ft. high upper sign and 8 feet wide x 1'-8" lower sign.
 - b. Material: 1/2-inch MD overlay board, painted.
 - c. Posts: 4x4 inches, wooden, painted; 2 required.
 - d. Framing and Braces: 2x4 inches.
 - e. Appearance: See Owner's (Academy) Job Sign below, Coming Soon timeline indicated on sign to be coordinated with Owner:
 - f. Location: G.C. to verify signage location with owner/tenant.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

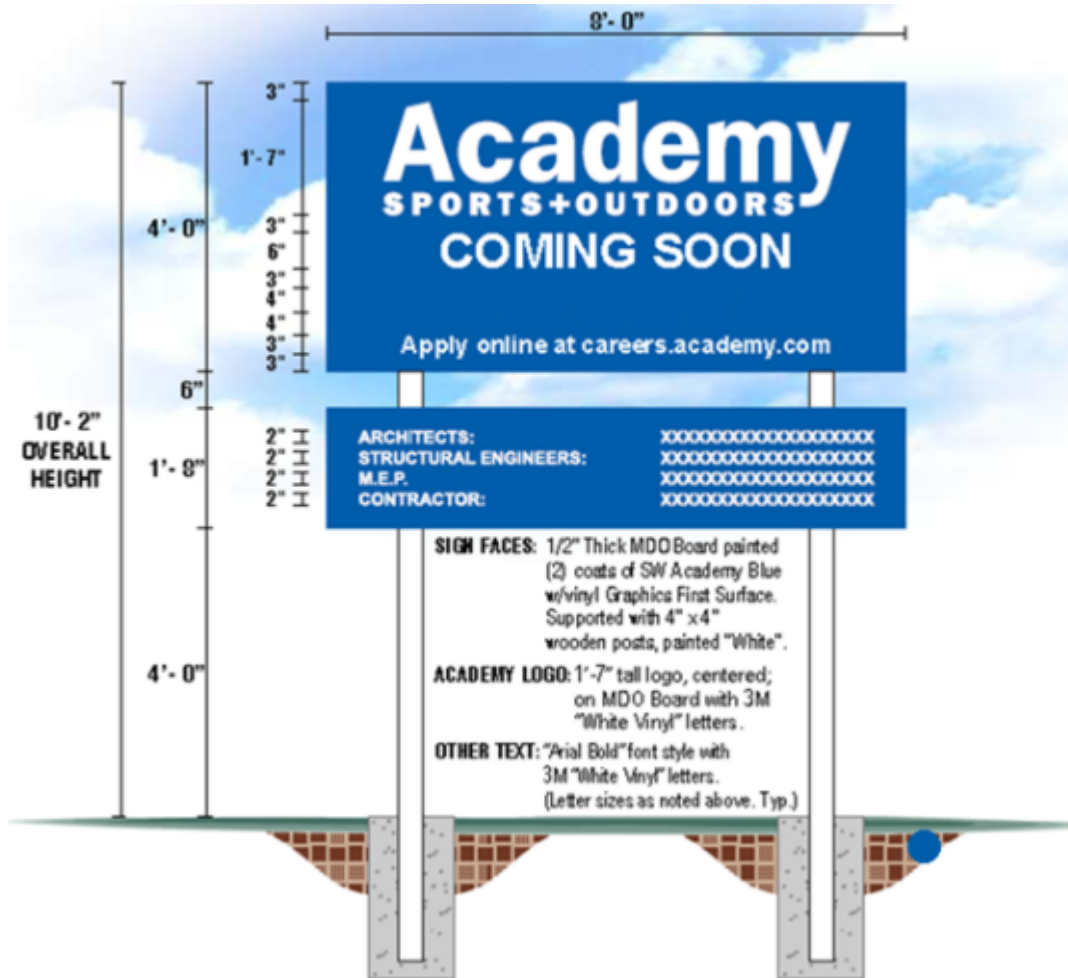


Figure 1

- H. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- G. Site Enclosure Fence (if required and of type indicated herein): Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed, and permanent enclosure is not complete, insulate temporary enclosures.
- L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
1. Construct (if required and as indicated) dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 2. Construct (if required and as indicated) dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 4. Insulate partitions to control noise transmission to occupied areas.
 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 6. Protect air-handling equipment.
 7. Provide walk-off mats at each entrance through temporary partition.
- M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from

water damage and keep porous and organic materials from coming into prolonged contact with concrete.

- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Discard or replace water-damaged and wet material.
 - 4. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- C. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.02 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 016116.
 - 2. If wet-applied, have lower VOC content, as defined in Section 016116.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 012500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, and other scope items to be determined.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- B. Section 014000 - Quality Requirements: Testing and inspection procedures.
- C. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- D. Section 015100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.
- E. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- F. Section 078400 - Firestopping.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

1.04 QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.05 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Perform dewatering activities, as required, for the duration of the project.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
 - 1. Pest Control Service: Monthly treatments.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.06 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
 - 4. Controlling lines and levels required for mechanical and electrical trades.
- I. Periodically verify layouts by same means.

- J. Maintain a complete and accurate log of control and survey work as it progresses.
- K. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Relocate items indicated on drawings.
 - 3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and _____): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- D. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
- E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

- F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- G. Refinish existing surfaces as indicated:
 - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 - 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- H. Clean existing systems and equipment.
- I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- J. Do not begin new construction in alterations areas before demolition is complete.
- K. Comply with all other applicable requirements of this section.

3.07

CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.
- J. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.

- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
 - 1. Aluminum and plastic beverage containers.
 - 2. Corrugated cardboard.
 - 3. Wood pallets.
 - 4. Clean dimensional wood.
 - 5. Land clearing debris, including brush, branches, logs, and stumps; see Section 311000 - Site Clearing for use options.
 - 6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
- E. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.
- F. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- D. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- E. Section 311000 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- E. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- F. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- H. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- I. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- J. Return: To give back reusable items or unused products to vendors for credit.
- K. Reuse: To reuse a construction waste material in some manner on the project site.
- L. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- M. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- N. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- O. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- P. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- Q. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.

- d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
- 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
- 6. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
- 7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 017800 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Record drawings.
 - 5. Spare parts and extra materials.
 - 6. Final cleaning.
 - 7. Repair of the Work.
- B. Related Requirements:
 - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 2. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. At the date set for Academy to begin installing fixtures (Turnover), the Academy Project Manager, Architect, and Superintendent will review the Building and/or Site and prepare a Punchlist. At this time it will be determined if the Building is Substantially Complete. A date will be set (approximately one week prior to Opening) for Contractor to have all items completed.
1. If during the course of his inspection the Architect determines that the Work is not substantially complete, he will discontinue the inspection and notify the Contractor that the Work does not comply with the requirements for Substantial Completion.
 2. When the Architect determines that the Work meets the requirements of Substantial Completion, the Architect will prepare a Certificate of Substantial Completion, AIA Document G704, for the Approval and Acceptance of the Owner and Contractor.
 3. The Architect will attach the punch list to the Certificate of Substantial Completion and the items on the punch list are to be completed or corrected within the time limits established in the Certificate of Substantial Completion.
- C. On the pre-determined date (approximately one week prior to Opening) the Academy Project Manager, Architect and Superintendent will review the Building and/or Site. The contractor will be responsible for having all items complete prior to Opening.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Submit list of incomplete items in the following format:
 - a. PDF electronic file. Architect will return annotated copy.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures." Include Consent of Surety Company to Final Payment AIA Document G707. Include resolution of outstanding Change Orders/Change Proposals.
 2. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 3. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information. Refer to Divisions 23 and 26 for additional copies required for Mechanical and Electrical portions of the Work.

4. Written One-Year Guarantee of Work.
5. Submit the following set of Final As-Built.
 - a. One (1) set of plans provided in the Electrical Room.
 - b. One Hard Copy and Two CD-ROM's of Final As-builts.
6. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - a. Contractor to warrant that modifications or substitutions suggested by the Contractor will give satisfactory results, and that they will be equal or superior to the specified item or method unless shortcomings are specifically listed in the request for modification or substitution.
7. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra material, and similar items, and deliver to location designated by Academy Project Manager. Label with manufacturer's name and model number where applicable. Provide names and addresses of local representatives of each unit of equipment. Index manuals containing items of different equipment.
8. Submit test/adjust/balance records.
9. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
10. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. A Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
11. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
12. Submit pest-control final inspection report and warranty.
13. Furnish to Owner, Affidavits from the Contractor, all subcontractors or all suppliers that no asbestos building materials have been installed in this Project.

B. Procedures Prior to Final Completion:

1. General Contractor is responsible for showing, coordinating, and directing Store Management on the following items:
 - a. Riser Cut-offs.
 - b. Main Water Cut-off.
 - c. Breaker Panel locations.
 - d. Irrigation/Sprinkler System Controls.
 - e. Parking Lot Light Timers.
 - f. Changing Batteries in Detex Hardware.
 - g. Exterior Hose Bibs.
 - h. Keying Sign-off Sheet.
 - i. Eyewash Station.
2. Perform preventative maintenance on equipment used prior to Final Completion.

3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment and systems.
 4. Repair or replace damaged portions of the construction, under Warranty, when damages result from faulty materials or negligent workmanship.
 5. Upon completion of the Work, Contractor shall deliver all keys, including master keys and any special keys, and two copies of the keying schedule to the Merchandising Team Leader and notify Academy Construction Project Manager.
 - a. Contractor to provide dated "Key Sign-off Sheet" to Store Director for final approval of keys and signature upon receipt of keys. Sheet to include itemized list of all keys (including compactor and cabinet keys). Copy of "Key Sign-off Sheet" signed by Store Director and Contractor is to be included in the Closeout Documents.
- C. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, the Architect and Construction Manager will either proceed with inspection or notify the Contractor of unfulfilled requirements. The Architect will prepare a final Certificate for Payment after inspection or will notify the Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- D. Final pay request (10% Retainage) will not be processed for payment until the above items are completed and forwarded to the Owner and Architect.

1.8 SUBMITTAL OF PROJECT CLOSE-OUT MANUAL

- A. Time of Submittal: Upon completion of the Work, Contractor has 30 days to provide two (2) (one for Owner, and One for the Architect) Project Close-Out Manuals containing the items listed above and all items listed below (Only send CD of Close-out Items to Architect).
1. Certificate of Substantial Completion.
 2. Completion of all Punch List Items.
 3. Copy of Permit & Certificate of Occupancy.
 4. Two (2) CD-ROM's of all Close-out Manual Documents (subdivided as listed below)
 - a. Building Permit
 - b. Pay Apps
 - c. Certificate of Occupancy
 - d. Final Lien Waivers for GC and Sub-contractors
 - e. As-Built Plans and Specifications
 - f. Asbestos Affidavits
 - g. Warranties
 - h. O&M Manuals
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1.9 RECORD DRAWINGS

- A. Prior to commencing any portion of the Work, the Contractor shall obtain one complete set of Drawings in the form of prints to be used as a record of the Work as constructed. This set of Drawings shall be identified on the front lower right-hand corner of each sheet by a rubber stamp impression reading as follows:

“RECORD DRAWINGS”
“TO BE USED FOR RECORDING FIELD DEVIATIONS AND DIMENSIONAL
DATA ONLY:

- B. As the Work progresses, the Contractor shall update the record drawings on a daily basis as required to maintain as accurate dimensional record of the work as constructed, including:
1. Exact locations and elevations of all underground and buried portions of the Work.
 2. All changes and corrections to dimensions.
 3. All changes of material and finishes.
 4. Location, size and arrangement of all concealed items of mechanical and electrical portions of the Work, including outlets, pipes, conduit, valves, dampers, duct work and equipment.
 5. Location, size and arrangement of exposed piping, valves, duct work, conduit and equipment.
 6. All changes and deviations in the Work from that indicated and specified in the Contract Documents.
- C. The “Record Drawing” set shall be submitted to the Architect for review at the time of Final Payment. The Architect will return these drawings to the Contractor who shall transfer all information onto an electronic format (scanned) copy for the Owner’s use. The “Record Drawings” along with the electronic copy shall be submitted to the Owner.

1.10 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish spare parts and extra materials needed for operation and maintenance matching products installed.
- B. Furnish spare parts and extra materials as specified in the individual sections listed in table below.

093013	Ceramic Tiling
096816	Carpet
099113	Exterior Painting
099123	Interior Painting
124813	Entrance Floor Mats and Frames
211000	Water Based Fire Suppression Systems
220010	General Plumbing Requirements
220553	Identification for Plumbing Piping and Requirements
221119	Domestic Water Piping Specialties
224000	Plumbing Fixtures
230010	General Mechanical Requirements
230553	Identification for HVAC Piping and Equipment

233423 HVAC Power Ventilators
233713 Diffusers, Registers, and Grilles
234100 Particulate Air Filtration
237413 Packaged, Outdoor, Central-Station Air-Handling Units
262813 Fuses
262816 Enclosed Switches and Circuit Breakers
280500 Electronic Safety and Security
281111 Digital, Addressable Fire Alarm Systems

- C. Furnish inventory list of spare parts and extra materials, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- D. Deliver the following to the Owner.
 - 1. Sprinkler Cabinets as specified in Section 211000. Install sprinkler cabinets where directed by Owner.
 - 2. Valve Keys as specified in Section 211119.
 - 3. Operating Keys as specified in Section 233713.
- E. Deliver all other spare parts and extra materials to Owner palletized and packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to the building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - p. Leave Project clean and ready for occupancy.

- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Final Completion.

- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.3 TERMINAL INSPECTION

- A. Immediately prior to expiration of the one-year guarantee period (11 months after Substantial Completion), the Contractor shall make an inspection of the Work in the company of the Architect and the Owner. The Architect and Owner shall be given not less than 5 days notice prior to the anticipated date of terminal inspection.
- B. Where any portion of the Work has proven to be defective and requires replacement, repair or adjustment, the Contractor shall immediately provide materials and labor necessary to remedy such defective Work and shall execute such Work without delay until completed to the satisfaction of the Architect and the Owner, even though the date of completion of the corrective work may extend beyond the expiration date of the guarantee period.
- C. The Contractor shall not be responsible for the correction of Work which has been damaged because of neglect or abuse by the Owner nor the replacement of parts necessitated by normal wear in use.

3.4 ATTACHMENTS

- A. Academy Close-out Document Checklist.

END OF SECTION 017700

ACADEMY SPORTS + OUTDOORS CLOSEOUT DOCUMENT CHECKLIST

Project Address: 3299 US 412

State: Arkansas

Project Store #: _____

Academy Project Manager: Valencia Thomas

We have reviewed your Closeout Documents and still need the below items that are NOT CHECKED:

- ☐ AIA G704 – Certificate of Substantial Completion (Building and Site)
- ☐ Contractor's Affidavit of Completion
- ☐ AIA G706 – Contractor's Affidavit of payment of Debts and Claims
- ☐ AIA G706A - Contractor's Affidavit of Release of Liens
- ☐ AIA G707 – Consent of Surety to Final Payment
- ☐ Certificate of Occupancy
- ☐ Closeout Books (O & M Manuals)
- ☐ Sub-contractor List
- ☐ General Contractor Warranty
- ☐ Sub-contractor Warranties
- ☐ Roof Warranty (Should be 15 yr Warranty)
- ☐ Per Specification 01 77 00, Part 2.02 – Provide Final Release of Liens that is conditional upon payment
- ☐ Final Release of Liens from Sub-contractors and material suppliers that are conditional upon payment
- ☐ Contractor/Architect Punch-list signed and complete
- ☐ Key Sign-Off Sheet
- ☐ PAO Certificate
- ☐ Elevation Certificate

Per Specification 017700, – Provide Operation & Maintenance Manuals for the below items:

- ☐ Stanley Access Technologies – Front Entry Doors
- ☐ Overhead Doors
- ☐ Chase Doors – High Impact Traffic Doors
- ☐ Alumatec – Side Folding Grille
- ☐ Cornell – Hurricane Shutters
- ☐ Dock Levelers
- ☐ Irrigation System
- ☐ VCT
- ☐ Plumbing
- ☐ HVAC
- ☐ Fire Sprinklers

Provide additional information as requested:

- ☐ HVAC Test & Balance Report, Invoice costs of HVAC Equipment
- ☐ COMcheck / IECC / ASHRAE Compliance
- ☐ Interior / Exterior Lighting Invoice of costs for building and parking lot
- ☐ Fire Sprinkler – Contractor's Material and Test Certificate for Above-ground Piping
- ☐ Fire Marshall Review Letter
- ☐ Proof that the Liens have been handled (Affidavit of Payments of Debts & Claims)
- ☐ RTU Data Sheet – shows Model #, Serial #, Layout etc.

Per Specification 01 77 00, Part 2.05 B – The "Record Drawings" (As-Built) shall be submitted to the Architect for review at the time of Substantial Completion. One complete set to include:

- ☐ Landscaping
- ☐ Civil
- ☐ Architectural
- ☐ Structural
- ☐ Mechanical
- ☐ Plumbing
- ☐ Fire Sprinkler
- ☐ Electrical
- ☐ Certified Materials Testing Report(s)
- ☐ As-Built ALTA Survey

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for quantity and submittal requirements.

1.2 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- C. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.

3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

2.2 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements, including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.

- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.2 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.3 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Documentation: Review the following items in detail:

- a. Emergency manuals.

- b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - h. Show where the Electrical panel- circuits (EMS), Override of Energy Management System.
 - i. Show where the riser cutoff is.
 - j. Show where the main water cutoff is.
 - k. Show where the labeled breaker panels are.
 - l. Show overview of irrigation sprinkler system.
 - m. Show where the roof access is.
 - n. Keys provided to store.
 - o. Show where the mailbox is and provide keys if necessary.
2. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
3. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
 - n. Review alarm system functionality.
 - o. Show functionality of the fire panel.
 - p. Show functionality of the parking lot light timers.
 - q. Show how to change batteries on panic bars.
 - r. Show how to operate exterior hose bibs and operations keys.
 - s. Show where eyewash station is and confirmed it has clear room-temperature water, is flowing and that streams are crossing each other.
4. Adjustments: Include the following:

- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 5. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 6. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 7. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly, component removal, repair, replacement, and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

END OF SECTION 017900

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SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS (PROVIDED BY OWNER'S PREFERRED CONTRACTOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- B. Related Documents:
 - 1. OPR and BOD documentation are included by reference for information only.

1.2 DEFINITIONS

- A. BOD: Basis Of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- C. CA: Commissioning Authority.
- D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.3 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CA.
- B. Members Appointed by Owner:
 - 1. CA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. The owner will engage the CA under a separate contract.
 - 2. Representatives of the facility user and operation and maintenance personnel.

3. Architect and engineering design professionals.

1.4 OWNER'S RESPONSIBILITIES

- A. Provide the OPR documentation to the CA and Contractor for information and use.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- C. Provide the BOD documentation, prepared by Architect and approved by Owner, to the CA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.5 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 1. Evaluate performance deficiencies identified in test reports and, in collaboration with the entity responsible for system and equipment installation, recommend corrective action.
 2. Cooperate with the CA for resolution of issues recorded in the Issues Log.
 3. Attend commissioning team meetings held on a variable basis.
 4. Integrate and coordinate commissioning process activities with construction schedule.
 5. Review and accept construction checklists provided by the CA.
 6. Complete construction checklists as Work is completed and provide to the Commissioning Authority.
 7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
 8. Complete commissioning process test procedures.

1.6 CA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Provide commissioning plan.
- C. Convene commissioning team meetings.
- D. Provide Project-specific construction checklists and commissioning process test procedures.
- E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CA will report the failure in the Issues Log.
- F. Prepare and maintain the Issues Log.

- G. Prepare and maintain completed construction checklist log.
- H. Witness systems, assemblies, equipment, and component startup.
- I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 019113

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 033560 – Modified Polished Concrete Floor Finishes
 - 2. Section 034713 – Tilt-Up Concrete

1.2 REFERENCE STANDARDS

- A. American Concrete Institute
 - 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials
 - 2. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
 - 3. ACI 301 - Specifications for Structural Concrete for Buildings
 - 4. ACI 305.1 - Hot Weather Concreting
 - 5. ACI 306.1 - Cold Weather Concreting; American Concrete Institute International.
 - 6. ACI 308.1 - Guide to Curing Concrete
 - 7. ACI 318 - Building Code Requirements for Structural Concrete and Commentary
 - 8. ACI 347 - Guide to Formwork for Concrete
- B. ASTM International
 - 1. A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - 2. A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 3. C33/C33M - Standard Specification for Concrete Aggregates.
 - 4. C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete.
 - 5. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
 - 6. C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
 - 7. C150/C150M - Standard Specification for Portland Cement.
 - 8. C171 - Standard Specification for Sheet Materials for Curing Concrete.
 - 9. C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - 10. C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 11. C309 - Standard Specification for Liquid Membrane-Forming Compounds for

- Curing Concrete.
12. C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
 13. C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
 14. C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
 15. C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
 16. C779/C779M - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
 17. E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 18. E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 ACTION SUBMITTALS

- A. Submittal Procedures: Unless indicated otherwise herein, submit in accordance with procedures specified in Spec Section 013300.
- B. Product Data: Brand name, chemical composition, installation directions and certificates of compliance for the following:
 1. Vapor Barrier and Tape.
 2. Curing Compound.
- C. Concrete Mix Design: For each concrete mixture.
 1. Refer to the Concrete Materials and Concrete Mixtures sections in Part 2 for mix design information. Include the items listed below in the concrete design mixture submittal.
 - a. Intended concrete placement location (Slab-on-grade, loading dock, foundations, etc.)
 - b. Cement Mill test reports
 - c. Concrete Aggregate designation, type, quality, and source
 - d. Sieve analysis
 - e. Concrete Aggregate Supplier Statement
 - f. Product data for concrete admixtures
 - g. Concrete compressive strength data
- D. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, placement and installation details.

1.4 INFORMATIONAL SUBMITTALS

- A. Material certificates.

- B. Material test reports.
- C. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
 - 2. All slab concrete to come from same concrete plant.
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code – Reinforced Steel."
- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- F. Pre-Installation Conference: Conduct conference at Project Site.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.7 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1.
 - 1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 305.1

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

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

1. ACI 301.
2. ACI 117.

2.2 CONCRETE MATERIALS

- A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II, gray.
2. Fly Ash: ASTM C 618, Class F.
 - a. Up to 20% fly ash allowed in site concrete and foundations only.
 - b. Fly ash is NOT allowed in concrete for the interior slab-on-grade.

- B. Coarse and Fine Aggregate: ASTM C 33/C 33M. Provide aggregates from single source.

1. Maximum Coarse-Aggregate Size: See Structural Drawings.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- C. Air-Entraining Admixture: ASTM C 260/C 260M. (See Structural Drawings for approved locations)

- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. DO NOT use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

- E. Water: ASTM C 94/C 94M and potable.

- F. Integral Color (Liquid Coloring Agent) at exterior columns:

1. Manufacturers: Subject to compliance with requirements, provide products by the

following:

- a. ColorFlo CF Liquid: 385 "Bark", by Solomon.
2. Cementitious materials and ratios MUST be consistent throughout the entire pour of the integral color concrete installation.

2.3 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned based on laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials:
 1. Use fly ash as needed to reduce the total amount of Portland cement. Fly ash shall not exceed 20 percent by mass of cementitious materials.
 2. For interior slab-on-grade, exposed in service, do not use fly ash, slag, or other supplementary cementitious materials.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.4 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Normal-Weight Concrete:
 1. Minimum Compressive Strength: As indicated on Structural Drawings at 28 days.
 2. Maximum W/C Ratio: 0.53.
 3. Slump Limit:
 - a. Unless shown otherwise on the structural drawings, proportion and design mixes to result in concrete slump at the point of placement as follows:
 - 1) Ramps and Sloping Surfaces -3" (+/-1")
 - 2) Pumped Concrete -5" (+/-1") at truck; -4" (+/-1") at pump.
 - 3) Interior Slabs -4" (+/- 1")
 - 4) All other concrete (not pumped) -4" (+/- 1")
 - b. When increased workability, pumpability, lower water-cement ratio, shrinkage reduction, or permeability reduction is required, then a superplasticizer admixture shall be considered for use. The maximum

slump with the use of superplasticizers shall be 8 inches unless otherwise approved by the Architect/Engineer and the Owner's Testing Laboratory.

- c. Any deviation from these values (such as concrete design to be pumped) shall be submitted to the Structural Engineer and Owner's Testing Laboratory for approval.
- d. Any slump in excess of these limits shall be rejected. Architect and/or Structural Engineer reserves right to require removal and reinstallation of all concrete in excess of these slumps, but at no cost to themselves or the projects owner. General Contractors and Subcontractors shall bear all costs.

4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.5 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

- 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating, tested on a hard steel troweled test specimen prepared in accordance with European Standard CEN/TS 14754. Curing compound must be compatible with bond breaker.

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. Dayton Superior: Clear Resin Cure J11W.
- b. Nox-Crete: Silcoseal Select Cure and Bond Breaker.
- c. Substitutions allowed only upon approval by Architect.

2.7 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Seamless Forms for Exterior Concrete Columns:

1. Basis of Design Product:
 - a. Sonotube Finish Free Forms
2. Use form release agent that is compatible with the sealer.

2.8 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as- drawn steel wire into flat sheets.
- C. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice" and CRSI's "Placing of Reinforcing Bars".

2.9 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice.

2.10 VAPOR BARRIERS

- A. Sheet Vapor Barrier: ASTM E1745, Class A, except with maximum water-vapor permeance of 0.01 perms. Include manufacturer's recommended adhesive or pressure-sensitive waterproof adhesive tape, minimum 2" width.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Reef Industries, Inc.: Griffolyn Green, 15-mil barrier.
 - b. Stego Industries, LLC.: Stego Wrap, 15-mil barrier.
 - c. Tex-trude: Xtreme Vapor Barrier, 15-mil barrier.
 - d. No substitutions.

2.11 JOINT FILLER - INTERIOR

- A. Epoxy Joint Filler: Two component, 100% solid, heavy duty semi-rigid epoxy joint filler. Low emitting sealant, medium gray color, meets or exceeds ACI 302.1 standards. Not for exterior joint application. Not for true expansion or isolation joints.
 1. Product and Manufacturer:

- a. MM-80 by Metzger/McGuire

2.12 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 and ACI 347, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR BARRIER INSTALLATION

- A. Sheet Vapor Barrier: Place, protect, and repair sheet vapor barrier according to ASTM E1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or pressure- sensitive waterproof adhesive tape, minimum 2" width.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" and CRSI's "Placing of Reinforcing Bars" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as shown on structural drawings.

- C. Control Joints in Slabs-on-Grade: Form weakened-plane control joints, sectioning concrete into areas as shown on structural drawings. Construct control joints for a depth equal to at least one- third of concrete thickness as follows:
 - 1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as shown on structural drawings.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Place concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Place concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that

created by the rubbing process.

- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Laser Screed floors and slabs-on-grade level, maintaining the following minimum F(F) Floor Flatness and F(L) Floor Levelness Values.
 - 1. Specified Overall Values:
 - a. F(F) of 50
 - b. F(L) of 35
 - 2. Local Minimum Values:
 - a. F(F) of 35
 - b. F(L) of 24
 - 3. Minimum Values at recessed slab in Entry and Cart Storage areas:
 - a. F(F) of 60
 - b. F(L) of 40
- B. Measure F(F) and F(L) in accordance with ASTM E 1155, within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- C. Correct the slab surface if composite overall value is less than specified and/or if the local value is less than the specified value.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.
- E. General Contractor to provide Academy with written verification that all F(F) and F(L) are met. Verification to be issued to Academy within 24 to 48 hours of completion of floor slab.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull- floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots.
Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated exposed to view or with a floor covering material.
 - 2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
- E. Broom Finish: Apply a medium broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated on drawings.

3.10 MODIFIED POLISHED CONCRETE FLOOR FINISH DENSIFIER, STAIN PROTECTOR, STAIN GUARD AND FULL POLISHING APPLICATION

- A. Apply polish concrete floor finish densifier, stain protector, stain guard and full polishing process according to Section 033560.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot- weather protection during curing.
 - 1. Prohibit and/or protect surface from any operations, chemicals and/or any other activities over concrete that could damage surface. **Do not operate tilt panel lifting cranes on the slab.**
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat the process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 CONCRETE ACCEPTANCE

- A. The surface of the finished concrete slab shall not be cracked. Occasional shrinkage cracks that do not exceed three feet (3 ft) in length will be acceptable. Cracks that extend through the entire panel and divide the panel into three (3) or more separate pieces are considered a divided panel. Divided panels will not be accepted and will require complete removal and replacement. Replacement shall begin and end at control joints. No cold joints in between control joints will be allowed.
- B. Concrete Repairs: Remove and replace concrete that does not meet specs and/or cannot be repaired and patched to meet Academy CPM approval.

3.13 PATCHING

- A. Allow inspection of concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Academy CPM upon discovery.
- C. Patch imperfections in accordance with ACI 301.
- D. Under areas to receive floor covering remove subfloor ridges and bumps; fill low spots cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface. All subfloor/underlayment patching must be done with a quality Portland/hydraulic cement based latex underlayment material. Refer to Section 035413.

- E. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Academy CPM or Architect for each individual area.

3.14 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Upon completion of supplemental pour backs in the space, additional testing to be completed in accordance to the Academy and Outdoor Design Criteria Manual, Section 09 "Independent Testing and Inspections".

END OF SECTION 033000

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SECTION 033560 –MODIFIED POLISHED CONCRETE FLOOR FINISHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Application of Densifier.
2. Modified Polishing process of concrete floor slabs.
3. Application of Stain Protector.
4. Application of Stain Resistor.

B. Related Requirements:

1. Section 017700 – Closeout Procedures.
2. Section 033000 - Cast-In-Place Concrete Slabs.
3. Section 033565 – Burnished Concrete Floor Finishes.
4. Section 039050 - Interior Concrete Slab Repairs.
5. Section 079200 - Joint Sealants.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):

1. ASTM C 309 – Standard Specification for Liquid Membrane Forming compounds for Curing Concrete

1.3 ACTION SUBMITTALS

A. Flooring Subcontractor to submit Product Data and Applicator Qualifications indicated below to General Contractor.

B. General Contractor to submit documents received from Flooring Subcontractor under provisions of Section 013300 – Submittal Procedures

C. Product Data: Manufacturer's Data Sheets and Material Safety Data Sheets (MSDS) on each product to be used, including:

1. Densifier: Brand name, chemical composition, manufacturer's recommended installation directions procedures and certificates of compliance with required standards. Submit 30 days prior to first concrete placement.
2. Stain Protector: Brand name, chemical composition, manufacturer's recommended installation directions procedures and certificates of compliance

- with required standards. Submit 30 days prior to first concrete placement.
3. Stain Resistor: Brand name, chemical composition, manufacturer's recommended installation directions procedures and certificates of compliance with required standards. Submit 30 days prior to first concrete placement.

D. Applicator Qualifications:

1. Provide documentation showing densifier, stain protector, and stain resistor applicator is certified by the respective product manufacturers.
2. Provide a list of a minimum of 20 projects performed within the last 6 years of similar type, size and complexity as this contract. (Flooring Subcontractor shall be rejected if they do not meet this requirement.)
3. Submit 30 days prior to first concrete placement.

- E. Provide name of technically qualified densifier, stain protector, and stain resistor manufacturer's field representative.

1.4 CLOSE OUT SUBMITTALS

A. Maintenance Data:

1. Flooring Subcontractor to submit Maintenance Data indicated to General Contractor.
 - a. Include instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum conditions under anticipated use.
 - b. Include precautions against cleaning products and methods which may be detrimental to finish and performance.
2. General Contractor to submit per Section 017700 - Closeout Procedures

1.5 QUALITY ASSURANCE

- A. Coordination: General Contractor to coordinate with Flooring Subcontractor the application of the final flooring finish process for the concrete work with work of other sections.
- B. Pre-installation Meetings: General Contractor to conduct pre-installation meeting with the Flooring Subcontractor to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements as applicable.
- C. Sequence with Other Work: General Contractor to coordinate application of densifiers, stain protector, and stain resistor with concrete installer.
- D. The Flooring Subcontractor shall ensure that the correct amount of densifier, stain protector and stain resistor is onsite and in numbered containers prior to commencement of work. Coordinate and storage requirements with General Contractor.

1.6 PREAPPROVAL MOCK-UP REQUIREMENTS

- A. Field Mock-up: Before performing work of this Section, Flooring Subcontractor to provide 10 feet by 10 feet field mock-up to verify selections made under submittals. Mock-up conditions to match proposed scope of work. Mock-up to remain until completion of scope as a reference. Mock-up to be approved by Academy CPM prior to commencement of any work. Approval does not constitute approval of deviations from Contract Documents, unless such deviations are approved by Architect in writing.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Flooring Subcontractor to dispense densifier, stain protector and stain resistor material from factory-sealed containers per manufacturers recommendations and as indicated in this specification.

1.8 FIELD CONDITIONS

- A. Damage and Stain Prevention:

- 1. General Contractor to provide reasonable care including but not limited to items specified hereinafter to protect the slab during the construction process.
 - a. Prohibit and/or protect surface from any operations, chemicals and/or any other activities over concrete that could damage surface.
 - b. Provide diapers on lifts to eliminate potential leaks of fluids.
 - c. All lift equipment to have non-marking tires.
 - d. Check tires on all lift equipment for nails and screws, remove nails/screws as required.
 - e. DO NOT use red or blue chalk on slab. Use only white chalk.
 - f. Slab shall remain broom cleaned. Construction debris that can damage the concrete surface shall be removed.

- B. Environmental Limitations:

- 1. General Contractor to comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and any other requirement, coordinate with Flooring Subcontractor.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General contractor to limit and control damage from moisture. Coordinate with flooring Subcontractor on the removal of standing moisture from floor before and after densifier and stain protector application as required.

1.10 WARRANTY

- A. Flooring Subcontractor to provide manufacturer's standard warranty for replacement of defective densifier and stain protector products.
- B. Flooring Subcontractor to warranty all craftsmanship for 1 year after completion and acceptance of work.
- C. Warranty does not include interior joint sealants, as the installer has no control over the building acclimatization, slab movement and concrete shrinkage, which is out of the limitations of the joint sealant design material & flexibility.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with project requirements, Flooring Subcontractor to provide products specified hereinafter as manufactured by the following to the extent for the specific product:
 - 1. Ameripolish, Inc., (800) 592-9320; www.customerservice@ameripolish.com
 - 2. SASE Companies, Inc., (800) 522-2606
 - 3. Superior Surface Solutions, (888) 471.5227; www.superiorsurfacesolutions.com
 - 4. Substitutions: NO SUBSTITUTIONS ALLOWED.

2.2 DENSIFIER PROTECTION PRODUCTS AND APPLICATION EQUIPMENT

- A. Pre-Densifier Floor Cleaner: As recommended by densifier manufacturer.
 - 1. High pH Cleaner: Crete-Cleaner by CK Enterprises
 - 2. Substitutions: NO SUBSTITUTIONS ALLOWED.
- B. Densifier: Concrete chemical densifier specifically for concrete surface treatment which reacts chemically to the concrete surface forming a clear, dense, durable, hard, abrasion-resistant surface. Product shall be a solution that is less than 10 g/l VOC.
 - 1. Ameripolish 3D HSL Densifier
 - 2. SASE D1
 - 3. Substitutions: NO SUBSTITUTIONS ALLOWED.
- C. Semi-Penetrating Stain Protector: Concrete chemical stain protector specifically for concrete surface treatment which reacts chemically to the concrete surface maintaining a clear, dense, durable, hard, abrasion- and chemical-resistant surface. Product shall be a solution that is less than 10 g/l VOC.
 - 1. Ameripolish 3D SP
 - 2. SASE ProtectPlus
 - 3. Substitutions: NO SUBSTITUTIONS ALLOWED.
- D. Subsurface Stain Resistor: Concrete chemical chloride protector specifically for concrete surface treatment which reacts chemically to the concrete surface maintaining

a clear, dense, durable, hard, abrasion- and chemical-resistant surface. Product shall be a solution that is less than 10 g/l VOC.

1. Ameripolish SR2
2. SASE SPR3
3. Substitutions: NO SUBSTITUTIONS ALLOWED.

E. Sprayer: Manufacturer approved high-volume, low-pressure sprayer and sprayer tip.

F. Accessory Supplies:

1. Oil Remediation System: Ameripolish Oil Ingester
2. pH Compatible Detergent: Ameripolish Rejuvenating Cleaner
3. Substitutions: NO SUBSTITUTIONS ALLOWED.

2.3 EQUIPMENT

A. Flooring Subcontractor to provide equipment as specified hereinafter.

B. Auto Scrubber Machines - Min. 33-inch Ride-On Automatic Battery Powered Scrubber Machine. Scrubber Machine Equipment used for cleaning operations shall have a head pressure of 150 lbs. minimum or as required to produce the specified results. Allow only battery powered scrubbers.

C. STONEKOR or SASE – 1,300 lb. Propane Concrete Grinding & Polishing Machine with a min. 30-inch head, Grinder/Polishers shall have minimum 785 pounds down force. Only allow propane powered grinding & polishing equipment

D. Burnishing Machine: High speed propane burnisher only, with a min 27-inch head generating pad speeds of 1,500 RPM or higher as verified with tachometer.

E. Polishing Pads: 3-inch Bonded Resin Diamonds (Pucks), Copper Resin, Hybrid Resin Metal, Diamond Impregnated Pads (DIPs) or Natural Hogs Hair pads; Grit level as required per polishing/burnishing pass to achieve specified gloss level.

F. Flooring Subcontractor to coordinate with General Contractor the storage and security of all Scrubber, Grinding/Polishing and Burnishing equipment as needed for afterhours storage. Security of equipment to be covered under the Subcontractor's insurance policy.

G. Dust extraction system: HEPA filtration vacuum, designed for use with all hand tools when grinding or sawing concrete (minimum 150 CFM air flow). Provide one of the following:

1. S26 HEPA Dust Extractor, by Pullman-Ermator.
2. Bull 150, by SASE Company, Inc.
3. Approved equal.

H. Joint Filler Removal and Preparation

1. Dust Buggy, by U.S. Saws.
 2. Approved equal.
- I. Surface Grinder: Handheld 5"-7" electric surface grinder with dustless shroud/housing.
1. Grinder Vac, by U.S. Saws.
 2. Makita Grinder.
 3. Metabo Grinder.
 4. Approved equal.
- J. Fiber Stripping Pads
1. Rapid Strip Disc, by Norton.
 2. Gator Fiber Disc, by Gator Finishing Products.
 3. Approved equal.

2.4 ACCESSORIES

- A. Flooring Subcontractor to provide and install accessories as specified hereinafter.
- B. Polishing Pads: Grinding: 3-inch Hybrid Resin Metal Bonded Diamond with (100 G if needed), 200-grits. Polishing: 3-inch Copper Resin-bond Diamond with 400 and 800-grits. Burnishing: Diamond Impregnated Pads (DIPs) with 1500 and 3000-grits. Grit level and application will depend on the condition of the slab. Grinding & polishing grits shall be by one of the following manufacturers.
1. Superior Surface Solutions, (888) 471-5227; www.superiorsurfacesolutions.com.
 2. SASE Company, Inc., (800) 522-2606; www.sasecompany.com
 3. STONEKOR, Inc., (800) 633-0519; www.stonekor.com
 4. Substitutions: NO SUBSTITUTIONS ALLOWED.
- C. Repair material / Structural Urethane: A product that is designed to repair cracks, spalling and surface imperfections. The specified bonding materials shall have sufficient bonding to adhere after polishing process and to have abrasion resistance equal to or greater than adjacent substrate. Smear floor/trowel down to cover repaired areas, grid off with surface grinder to a smooth finish. **Material shall be tinted to match adjacent surface prior to application.**
- D. TX3, Hi-Tech Structural Epoxy Systems, (800) 454-5530; www.hitechpolyurea.com
1. Substitutions: NO SUBSTITUTIONS ALLOWED.
- E. Grout Material: A thin mortar used for filling voids, pinholes, and small surface cracks. The specified bonding materials shall have sufficient bonding to adhere after polishing process and to have abrasion resistance equal to or greater than adjacent substrate. Smear floor/trowel down to cover repaired areas, grid off with surface grinder to a smooth finish. **Material shall be tinted to match adjacent surface prior to application.**

1. Diamakrete Polish Grout; Superior Surface Solutions, (888) 471-5227; www.superiorsurfacesolutions.com
2. TX3, Hi-Tech Structural Epoxy Systems, (800) 454-5530; www.hitechpolyurea.com
3. Substitutions: NO SUBSTITUTIONS ALLOWED.

F. Interior Control Joint Sealants: Polyurea Elastomer Joint Filler: Rapid setting, self-leveling, two-component polyurea polymer liquid of 100% solids content, Shore hardness 85-90, compatible with construction materials in contact, and use of concrete floor stain preventing film.

1. HT-PE85 MI, Hi-Tech Systems, (800) 454-5530; www.hitechpolyurea.com
2. Substitutions: NO SUBSTITUTIONS ALLOWED.

G. Application: Follow manufacturer's recommendations; reference Technical Data Sheets provided by manufacturer.

2.5 SUPPLEMENTAL SUPPLIES

- A. General Contractor to provide onsite a 20-yard dumpster. General Contractor to coordinate delivery prior to commencement of floor polishing application and removal of dumpster upon completion of floor polishing. General Contractor and Flooring Subcontractor to coordinate schedule. Alternate option: General Contractor to provide Flooring Subcontractor access to on-site wash out pit.
- B. Flooring Subcontractor to provide blue tarp liner for 20-yard dumpster and is responsible for disposal and cleanup once work is completed.
- C. Flooring Subcontractor to provide 50 lb. bags of Slurry Dry/Gel as needed from Superior Surface Solutions, (816) 471-5227.
- D. General Contractor to provide water supply to building for wet grind application.

PART 3 - EXECUTION

PARTY RESPONSIBLE IS IDENTIFIED FOR EACH SECTION LISTED BELOW. SCOPE OF WORK THAT DOES NOT REFERENCE A SPECIFIC RESPONSIBLE PARTY SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

3.1 EXAMINATION

A. SITE VERIFICATION OF CONDITIONS:

1. General Contractor and Flooring Subcontractor to verify that interior concrete substrate conditions, which have been previously installed under other sections are acceptable for product installation in accordance with the Manufacturer's instructions prior to installation of concrete finishing materials.
2. General Contractor and Flooring Subcontractor Examine surface to determine

- the soundness of the concrete for polishing.
3. Flooring Subcontractor shall not begin installation of final finish process until substrates have been properly prepared.
 4. Reference Flooring Plan and Room Finish Schedule in Academy Sports + Outdoors drawings for floor areas that are to be polished and burnished.
 5. Flooring Subcontractor shall notify General Contractor, Architect, and Academy CPM of unsatisfactory substrate conditions prior to proceeding with installation of final finish.
 6. Allow all new concrete slabs to achieve its 28-day design strength as documented by General Contractor or Construction Testing Lab, before grinding or polishing can commence.
 7. Building or Sales floor to be conditioned (HVAC Conditioned Space) for 7 days prior to any joint sealing or polishing operations to help limit the joint sealant cracking during the building acclimation.
 8. If slab floor flatness (FF), levelness (FL), slab placement, or concrete finish (trowel defects) does not meet acceptable polishing requirements, the slab may be rejected by Flooring Subcontractor. If slab is rejected, the Flooring Subcontractor to notify the General Contractor reasons for unacceptable conditions, General Contractor to notify Academy Sports + Outdoors Construction Project Manager (CPM) of rejection and request approval for a heavier grinding process to be implemented. The authorization for this change will need to be provided in writing by Academy Sports + Outdoors CPM to General Contractor prior to proceeding with grinding and polishing of concrete slab.

3.2 PREPARATION

A. GENERAL CLEANING AND PREPARATION OF SLAB

1. General Contractor to clean and prepare slab as indicated in this section.
2. General Contractor to coordinate joint filling operation with Flooring Subcontractor. General Contractor and Flooring Subcontractor shall not perform wet cleaning within 72 hours prior to joint filling or per joint filler manufacturer's recommendations. Joint filling to be performed by Flooring Subcontractor.
3. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.
4. Do not use stain or scuff removing agents on finished floor surface.
5. Broom clean slab just prior to polishing application process.
6. General Contractor to remove all equipment and construction materials at areas to be polished for the agreed upon timeline for the polishing application. Coordinate areas and timeline with Flooring Subcontractor.
7. General Contractor to prep at least half of the sales area for application of modified polish. Preparation of remainder of floor areas to receive modified polish or burnish to be scheduled and coordinated with the Flooring Subcontractor.
8. General Contractor to provide onsite supervision and accommodations (lighting), if Flooring Subcontractor desires to run a "2nd shift" or "night shift" crews, in order to complete this scope in a timely fashion.

3.3 VAPOR TESTING CONCRETE FLOORS

- A. General Contractor shall coordinate testing of the concrete floors as indicated, submit test results to Owner, Architect and Flooring Subcontractor.
- B. Alkalinity:
 - 1. Test Method: Measure pH according to method indicated in ASTM F 710.
 - 2. Acceptable results: 8 to 13.
- C. Moisture Vapor Transmission Rate:
 - 1. Test Method: Perform anhydrous calcium chloride test according to ASTM F 1869.
 - 2. Acceptable results: Not more than 5 pounds per 1000 square feet in 24 hours.
- D. Relative humidity:
 - 1. Test Method: Perform relative humidity test using in-situ probes according to
 - 2. ASTM F 2170.
 - 3. Acceptable results: Not more than 75 percent.

3.4 MODIFIED POLISHING REQUIREMENTS

- A. Flooring Subcontractor shall perform modified polishing process preparation, cleaning and application as indicated hereinafter.
- B. Polish floors as specified hereinafter including applications of densifier, stain protector and stain resistor as indicated.
- C. Final finish sheen shall be equivalent to that as accepted on the approved Field Mock-Up, as referenced previously in this section, and as specified hereinafter.

3.5 CLEANING AS A PART OF THE MODIFIED POLISHING PROCESS

- A. Use non-oil-based sweeping compound to control airborne dust.
- B. Treat oil spots with Oil Remediation System specified.
- C. Scrub floor with Auto-Scrubber machine and appropriate brushes or pads and Multipurpose Compatible Detergent specified.
- D. Examine surfaces receiving polish, densifier, stain protector and stain resistor. Verify that surfaces conform to product(s) manufacturer's requirements for substrate conditions.
- E. Vacuum and clean saw cut joints and surrounding area so that no dust remains to react with concrete finish material.

- F. Remove any foreign materials prior to application of polish, densifier, stain protector and stain resistor. Remove compound by cleaning and scrubbing in accordance with manufacturer's instructions.
- G. Prior to polishing application, scrub floor with water to remove latent salts. Do not proceed until unsatisfactory conditions have been corrected.
- H. Beginning of application indicates acceptance of existing conditions.

3.6 MODIFIED POLISHING APPLICATION

- A. Commencement of work by the Flooring Subcontractor constitutes an acceptance of existing conditions.
- B. The following procedures are the chronologically ordered steps required to accomplish the specified slab final finish. Application procedure may vary due to unique project conditions including – but not limited to - hardness of concrete. Do not use any polishing pad that may damage the concrete slab surface prior to strength development at any given time of the polishing/densification process. Procedures used to accomplish approved mock-up shall prevail. Conformance or deviation from the following steps does not remove Subcontractor from providing the specified finish. Use wet grinding only for all steps with 800-grit, 3-inch Resin Diamond Pads and below; do not allow dry grinding during these steps. Dry grinding is acceptable at the polishing phase as indicated below, beginning with the 800-grit, 3-inch Copper Resin Diamond Pads if needed based on the conditions of the slab. Alternating wet and dry applications to be applied at the 1500-grit Diamond Impregnated Pad and 3000-grit Diamond Impregnated Pad burnish steps in the application process. The alternation of the wet/dry applications will depend on the condition of the slab.
 - 1. Clean slab using High pH cleaner specified, and pads as recommended by manufacturer, rinse slab as required by manufacturer.
 - 2. Saw cut, clean, and prep control joints as required for installation of joint fillers as recommended by joint filler manufacturer.
 - 3. Apply joint fillers to full depth of joint and repair spalls/holes in slab as required with specified repair materials and grind down to provide a smooth finish.
 - 4. Before, between and after final wet polishing passes, thoroughly scrub and rinse slab surface with clean water (high pH Cleaner) and vacuum with auto-scrubber machine.
 - 5. Wet grind at a slow movement pace using Grinding & Polishing machine with 200-grit Copper Resin Diamond 3-inch Pads. If slab condition is bad, start with a 100-grit pad at this initial grinding stage. The number of passes for the wet grind will vary based on the condition of the slab and the requirements to attain the desired final Finished Gloss levels as specified.
 - 6. Sequential progression of diamond pads shall be required and limited to no more than double the grit value of the previous diamonds used.
 - 7. Wet grind in sequential steps at a slow movement pace using Grinding & Polishing machine with 400-grit Copper Resin Diamond 3-inch Pads. The number

of passes for the wet grind will vary based on the condition of the slab and the requirements to attain the desired final Finished Gloss levels as specified.

8. Between every step remove all dust and debris using an automatic floor scrubber and fresh water. Allow to dry.
9. Apply densifier as specified in this spec section, reapply to rejection, allow to dry.
10. Polishing Phases Start: Wet (or Dry) polish at a slow movement pace using Grinding & Polishing machine with 800-grit Copper Resin Diamond 3-inch Pads.
11. Wet burnish at a slow movement pace using burnishing machine with 1500-grit Diamond Impregnated pads. The number of passes for the wet grind will vary based on the condition of the slab and the requirements to attain the desired final Finished Gloss levels as specified.
12. Remove all dust and debris using an automatic floor scrubber and fresh water. Allow to dry.
13. Dry burnish in a slow movement pace using a propane Burnishing Machine with 3000- grit Diamond Impregnated Pads (DIPs), dry application.
14. Apply Semi-Penetrating Stain Protector as specified in this spec section, reapply to rejection, allow to dry.
15. Dry burnish in a slow movement pace using a propane Burnishing Machine with 3000- grit Diamond Impregnated Pads (DIPs), dry application. The number of passes for the will vary based on the condition of the slab and the requirements to attain the desired final Finished Gloss levels as specified.
16. Provide caulk, patch and joint sealant touch up as required to provide smooth finish. Reference applicable sections for approved repair and grout material.
17. Thoroughly vacuum and clean slab per manufacturer's recommendations prior to the application of stain resistor and protection products.
18. Apply Subsurface Stain Resistor at designated areas per these specifications. Prep areas to receive protectors as indicated in respective sections of these specifications.
19. Reburnish slab with 3000-grit Diamond Impregnated Pads or Natural Hogs Hair pads to reach specified gloss levels.

C. Finished Gloss Level:

1. Finished Gloss Level:
 - a. Reflective Sheen Rating: Average between 35-50 per ASTM D523 prior to stain protector application.
2. Flooring Subcontractor to verify gloss level readings with Gloss Meter (General Contractor to assist in readings). Provide photos of the readings attained at minimum of (5) locations throughout Sales, and Corridor areas to the General Contractor for the owner. Identify locations tested on photos. Gloss level reading to be performed at the end of the polishing process.

D. Final Aggregate Exposure:

1. Concrete Polishing Association of America (CPAA) Design Intent: Class A/B,

Level 4 Shine, Cream Polish, **MINIMAL** Salt, and Pepper aggregate exposure.

3.7 DENSIFIER APPLICATION

- A. Area to be Treated: Apply densifier to all interior polished concrete floors as indicated on Drawings. Densifier to be applied between grinds as indicated in the Modified Polish Section of this specification.
- B. Application:
 - 1. Application shall be performed by a certified applicator in accordance with manufacturers published instructions.
 - 2. Schedule to begin minimum 28-days after floor slab placement.
 - 3. Employ methods to ensure concrete surface is not damaged during application, including discoloration.
 - 4. Apply densifier finish at the rate recommended by manufacturer.
 - 5. Apply with low pressure sprayer with conical tip with enough coverage to keep concrete surface wet for minimum 20-minute period.
 - 6. Reapply densifier to rejection.

3.8 STAIN PROTECTOR APPLICATION

- A. Area to be Treated: Apply stain protector to interior modified polished and burnished concrete floors as indicated on Room Finish Schedule in Drawings.
- B. Application:
 - 1. Application shall be performed by a certified applicator in accordance with manufacturers published instructions. The application of the Stain Protector is a dry application process.
 - 2. Employ methods to ensure concrete surface is not damaged during application, including discoloration.
 - 3. Apply stain protector finish at the rate recommended by manufacturer.
 - 4. Apply with low pressure sprayer with conical tip and follow with microfiber applicator pad.
 - 5. Apply stain protector to rejection.
 - 6. Apply second coat of stain protector, apply over surfaces to which stain protector has been applied.
 - 7. Apply stain protector finish at twice coverage rate recommended by manufacturer; i.e. manufacturer recommended 2,000 SF – apply at 4,000 SF rate.
 - 8. Apply with low pressure sprayer with conical tip and follow with microfiber applicator pad.
 - 9. Once the application is dry, apply high speed burnish to surface with a 3000-grit Diamond Impregnated pad or Natural Hogs Hair pad.
 - 10. General Contractor to protect final polished concrete slab from water and other liquids for a minimum of 24 hours after application of the Stain Protector.

3.9 STAIN RESISTOR APPLICATION

- A. Area to be treated: Apply stain resistor to interior modified polished floors at the Sales Entrance area approximately 10-feet inside the second set of doors or to the nearest control joint. Also apply stain resistor to Alcove, Break Room, Cart Storage and Corridor. Application to continue to nearest control joint surrounding the space indicated.
- B. Application:
 - 1. Application shall be performed by certified applicator in accordance with manufacturers published instructions. The application of the Stain Resistor is a dry application process.
 - 2. Employ methods to ensure concrete surface is not damaged during application, including discoloration.
 - 3. Apply stain resistor finish at the rate recommended by manufacturer.
 - 4. Apply with low pressure sprayer with conical tip and follow with microfiber applicator pad.
 - 5. Apply stain resistor to rejection.
 - 6. Apply second coat of stain resistor, apply over surfaces to which stain resistor has been applied.
 - 7. Apply stain resistor finish at twice coverage rate recommended by manufacturer; i.e. manufacturer recommended 2,000 SF – apply at 4,000 SF rate.
 - 8. Apply with low pressure sprayer with conical tip and follow with microfiber applicator pad.
 - 9. Once each application is dry, apply high speed burnish to surface with a 3000-grit Diamond Impregnated Pad or Natural Hogs Hair pad.
 - 10. General Contractor to protect final polished concrete slab from water and other liquids for a minimum of 24 hours after the application of the Stain Resistor.

3.10 FLOOR PROTECTION

- A. General Contractor to use reasonable care before, during and after the construction process to protect the finished floor from construction traffic and weather until time of Owner Possession. Protection includes but is not limited to maintaining the gloss levels attained by Flooring Subcontractor.
- B. General Contractor to use reasonable care before, during and after the construction process to prohibit caustic chemicals and materials, acids, and acidic detergents to come in contact with slab. Do not apply adhesives or adhesive tapes to concrete surface.
- C. General Contractor to use reasonable care before, during and after the construction process to maintain cleanliness of the finished polished concrete floor until time of Owner Possession.

3.11 PRODUCT DISPOSAL

- A. Upon completion of densifier, stain protector and stain resistor application, Flooring

Subcontractor to dispose of excess material as required by local agency having jurisdiction.

- B. Flooring Subcontractor shall remove densifier, stain protector and stain resistor product containers from job site immediately upon completion of treatment.

3.12 MAINTENANCE PROCEDURES

- A. Flooring Subcontractor to provide General Contractor with Maintenance Guide for maintenance of polished floors.
- B. Flooring Subcontractor to provide 5-Gallon Pail of Ameripolish Multipurpose Rejuvenating Cleaner as specified for store maintenance team.
- C. Maintenance Meetings: General Contractor to conduct meeting with Flooring Subcontractor prior to maintenance procedures to verify project requirements, manufacturer's maintenance instructions and manufacturer's warranty requirements as applicable. A manufacturer's representative shall be included in maintenance meetings. General Contractor to provide all documentation on warranty and maintenance to Owner.
- D. General Contractor and owner to utilize maintenance system, chemicals, and other related sundries as recommended by chemical products manufacturer, for maintenance of floor surface.

END OF SECTION 033560

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Modified Polished Concrete Floor
Finished

SECTION 033565 – BURNISHED CONCRETE FLOOR FINISHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Application of Densifier
2. Burnishing process of concrete floor slabs

B. Related Requirements:

1. Section 017700 – Closeout Procedures
2. Section 033000 - Cast-In-Place Concrete Slabs.
3. Section 033560 - Modified Polished Concrete Floor Finishes
4. Section 039050 - Interior Concrete Slab Repairs
5. Section 079200 - Joint Sealants

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. ASTM International (ASTM):

1. ASTM C 309 – Standard Specification for Liquid Membrane Forming compounds for Curing Concrete

1.3 ACTION SUBMITTALS

A. Flooring Subcontractor to submit Product Data and Applicator Qualifications indicated below to General Contractor

B. General Contractor to submit documents received from Flooring Subcontractor under provisions of Section 01330 – Submittal Procedures

C. Product Data: Manufacturer's Data Sheets and Material Safety Data Sheets (MSDS) on each product to be used, including:

1. Densifier: Brand name, chemical composition, manufacturer's recommended installation directions procedures and certificates of compliance with required standards. Submit 30 days prior to first concrete placement.

D. Applicator Qualifications:

1. Provide documentation showing densifier and stain protector applicator is certified by the respective product manufacturers.

2. Provide a list of a minimum of 20 projects performed within the last 6 years of similar type, size, and complexity as this contract. (Flooring Subcontractor shall be rejected if they do not meet this requirement.)
 3. Submit 30 days prior to first concrete placement.
- E. Provide the name of technically qualified densifier and stain protector manufacturer's field representative.

1.4 CLOSE OUT SUBMITTALS

A. Maintenance Data:

1. Flooring Subcontractor to submit Maintenance Data indicated to General Contractor.
 - a. Include instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum conditions under anticipated use.
 - b. Include precautions against cleaning products and methods which may be detrimental to finish and performance.
2. General Contractor to submit per Section 017700 - Closeout Procedures.

1.5 QUALITY ASSURANCE

- A. Coordination: General Contractor to coordinate with Flooring Subcontractor the application of the final flooring finish process for the concrete work with work of other sections.
- B. Pre-installation Meetings: General Contractor to conduct pre-installation meeting with the Flooring Subcontractor to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements as applicable.
- C. Sequence with Other Work: General Contractor to coordinate application of densifiers and stain protector with concrete installer.
- D. The Flooring Subcontractor shall ensure that the correct amount of densifier and stain protector is onsite and in numbered containers prior to commencement of work. Coordinate and storage requirements with General Contractor.

1.6 PREAPPROVAL MOCK-UP REQUIREMENTS

- A. Field Mock-up: Before performing work of this Section, Flooring Subcontractor to provide 10 feet by 10 feet field mock-up to verify selections made under submittals. Mock-up conditions to match proposed scope of work. Mock-up to remain until completion of scope as a reference. Approval does not constitute approval of deviations from Contract Documents, unless such deviations are approved by Architect in writing.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Flooring Subcontractor to dispense densifier and stain protector material from factory-sealed containers per manufacturers recommendations and as indicted in this specification.

1.8 FIELD CONDITIONS

A. Damage and Stain Prevention:

- 1. General Contractor to provide reasonable care including but not limited to items specified hereinafter to protect the slab during the construction process.
 - a. Prohibit and/or protect surface from any operations, chemicals and/or any other activities over concrete that could damage surface.
 - b. Provide diapers on lifts to eliminate potential leaks of fluids.
 - c. All lift equipment to have non-marking tires.
 - d. Check tires on all lift equipment for nails and screws, remove nails/screws as required.
 - e. DO NOT use red or blue chalk on slab. Use only white chalk.

A. Environmental Limitations:

- 1. General Contractor to comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and any other requirement, coordinate with Flooring Subcontractor.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. General contractor to limit and control damage from moisture. Coordinate with flooring Subcontractor on the removal of standing moisture from floor before and after densifier and stain protector application as required.

1.10 WARRANTY

- A. Flooring Subcontractor to provide manufacturer's standard warranty for replacement of defective densifier product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with project requirements, Flooring Subcontractor to provide products specified hereinafter as manufactured by the following to the extent for the specific product:
 - 1. Ameripolish, Inc., (800) 592-9320; www.customerservice@ameripolish.com
 - 2. SASE Companies, Inc., (800) 522-2606

3. Substitutions: NO SUBSTITUTIONS ALLOWED.

2.2 DENSIFIER PRODUCTS

- A. Pre-Densifier Floor Cleaner: As recommended by densifier manufacturer.
 - 1. High pH Cleaner: Crete-Cleaner by CK Enterprises
 - 2. Substitutions to be approved by Architect.
- B. Densifier: Concrete chemical densifier specifically for concrete surface treatment which reacts chemically to the concrete surface forming a clear, dense, durable, hard, abrasion-resistant surface. Product shall be a solution that is less than 10 g/l VOC.
 - 1. Ameripolish 3D HS Densifier
 - 2. SASE D2
- C. Sprayer: Manufacturer approved high-volume, low-pressure sprayer and sprayer tip.
- D. Accessory materials:
 - 1. Oil Remediation System: Ameripolish Oil Remediation System
 - 2. pH Compatible Detergent: Ameripolish Rejuvenating Cleaner

2.3 EQUIPMENT

- A. Flooring Subcontractor to provide equipment as specified hereinafter. Scrubber Machine Equipment used for cleaning operations shall have a head pressure of 150 lbs. or as required to produce the specified results.
- B. Burnishing Machine: High speed propane burnisher only, with a min. 27-inch head generating pad speeds of 1,500 RPM or higher as verified with tachometer.
- C. Burnishing Pads: Diamond impregnated or Natural Hogs Hair pads.
- D. Flooring Subcontractor to coordinate with General Contractor the storage and security of all burnishing equipment as needed for afterhours storage. Security of equipment to be covered under the Subcontractor's insurance policy.
- E. Dust extraction system: HEPA filtration vacuum, designed for use with all hand tools when sawing concrete (minimum 125 CFM air flow). Provide one of the following:
 - 1. S26, by Pullman-Ermator.
 - 2. Bull 50, by SASE Company, Inc.
 - 3. Approved equal.
- F. Joint Filler Removal and Preparation
 - 1. Dust Buggy, by U.S. Saws.
 - 2. Approved equal.

G. Fiber Stripping Pads

1. Rapid Strip Disc, by Norton.
2. Gator Fiber Disc, by Gator Finishing Products.
3. Approved equal.

2.4 ACCESSORIES

A. Flooring Subcontractor to provide and install accessories as specified hereinafter.

B. Burnishing Pads: Diamond Impregnated Pads, Diamashine (DIPs) Pads 800-grit or higher, or Hog Hair pads shall be used by one of the following manufactures.

1. Superior Surface Solutions, (888) 471-5227; www.superiorsurfacesolutions.com.
2. SASE Company, Inc., (800) 522-2606; www.sasecompany.com
3. Substitutions: NO SUBSTITUTIONS ALLOWED.

C. Repair material / Structural Urethane: A product that is designed to repair cracks, spalling and surface imperfections. The specified bonding materials shall have sufficient bonding to adhere after burnishing process and to have abrasion resistance equal to or greater than adjacent substrate. Material shall be tinted to match adjacent surface prior to application.

D. TX3, Hi-Tech Structural Epoxy Systems, (800) 454-5530; www.hitechpolyurea.com

1. Substitutions: NO SUBSTITUTIONS ALLOWED.

E. Grout Material: A thin mortar used for filling voids, pinholes, and small surface cracks. The specified bonding materials shall have sufficient bonding to adhere after burnishing process and to have abrasion resistance equal to or greater than adjacent substrate. Material shall be tinted to match adjacent surface prior to application.

1. Diamakrete Polish Grout; Superior Surface Solutions, (888) 471-5227; www.superiorsurfacesolutions.com
2. TX3, Hi-Tech Structural Epoxy Systems, (800) 454-5530; www.hitechpolyurea.com
3. Substitutions: NO SUBSTITUTIONS ALLOWED.

F. Interior Control Joint Sealants: Polyurea Joint Filler: Rapid setting, two-component polyurea polymer liquid of 100% solids content, Shore hardness 85-90, compatible with construction materials in contact, and use of concrete floor stain preventing film.

1. HT-PE85, Hi-Tech
2. Substitutions: NO SUBSTITUTIONS ALLOWED.

G. Application: Follow manufacturer's recommendations; reference Technical Data Sheets provided by manufacturer.

2.5 SUPPLEMENTAL SUPPLIES

- A. General Contractor to provide onsite a 20-yard dumpster. General Contractor to coordinate delivery prior to commencement of floor polishing application and removal of dumpster upon completion of floor polishing. General Contractor and Flooring Subcontractor to coordinate schedule. Alternate option: General Contractor to provide Flooring Subcontractor access to on-site wash out pit.
- B. Flooring Subcontractor to provide blue tarp liner for 20-yard dumpster.
- C. Flooring Subcontractor to provide 50 lb. bags of Slurry Dry/Gel as needed from Superior Surface Solutions, (816) 471-5227.
- D. General Contractor to provide water supply to building for wet burnish application.

PART 3 - EXECUTION

PARTY RESPONSIBLE IS IDENTIFIED FOR EACH SECTION LISTED BELOW. SCOPE OF WORK THAT DOES NOT REFERENCE A SPECIFIC RESPONSIBLE PARTY SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

3.1 EXAMINATION

- A. Site verification of conditions:
 - 1. General Contractor and Flooring Subcontractor to verify that interior concrete substrate conditions, which have been previously installed under other sections are acceptable for product installation in accordance with the Manufacturer's instructions prior to installation of concrete finishing materials.
 - 2. General Contractor and Flooring Subcontractor Examine surface to determine the soundness of the concrete for burnishing.
 - 3. Flooring Subcontractor shall not begin installation of final finish process until substrates have been properly prepared.
 - 4. Reference Flooring Plan and Room Finish Schedule in Academy Sports + Outdoors drawings for floor areas that are to be burnished.
 - 5. Flooring Subcontractor shall notify General Contractor and Architect of unsatisfactory substrate conditions prior to proceeding with installation of final finish.
 - 6. Allow all new concrete slabs to achieve its 28-day design strength as documented by General Contractor or Construction Testing Lab, before burnishing can commence.

3.2 PREPARATION

- A. General cleaning and preparation of slab
 - 1. General Contractor to clean and prepare slab as indicated in this section.
 - 2. General Contractor to coordinate joint filling operation with Flooring Subcontractor. Do not perform wet cleaning within 72 hours prior to joint filling or

- per joint filler manufacturer's recommendations. Joint filling to be performed by Flooring Subcontractor.
3. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.
 4. Do not use stain or scuff removing agents on finished floor surface.
 5. Broom clean slab just prior to burnishing application process.
 6. General Contractor to remove all equipment and construction materials at areas to be burnished for the agreed upon timeline for the burnishing application. General Contractor to prep at least half of the receiving area for application of burnishing. Preparation of remainder of floor areas to receive burnish concrete to be scheduled and coordinated with the Flooring Subcontractor.
 7. General Contractor to provide onsite supervision and accommodations (lighting), if Flooring Subcontractor desires to run a "2nd shift" or "night shift" crews in order to complete this scope in a timely fashion.

3.3 VAPOR TESTING CONCRETE FLOORS

A. Alkalinity:

1. Test Method: Measure PH according to method indicated in ASTM F 710.
2. Acceptable results: 8 to 13.

B. Moisture Vapor Transmission Rate:

1. Test Method: Perform anhydrous calcium chloride test according to ASTM F 1869.
2. Acceptable results: Not more than 5 pounds per 1000 square feet in 24 hours.

C. Relative humidity:

1. Test Method: Perform relative humidity test using in-situ probes according to ASTM F 2170.
2. Acceptable results: Not more than 75 percent.

3.4 BURNISHING REQUIREMENTS

- A. Flooring Subcontractor shall perform burnishing process preparation, cleaning and application as indicated hereinafter.
- B. Burnish floors as specified hereinafter including applications of densifier and stain protector as indicated.
- C. Final finish sheen shall be equivalent to that as accepted on the approved Field Mock-Up, as referenced previously in this section, and as specified hereinafter.

3.5 CLEANING AS A PART OF THE BURNISHING PROCESS

- A. Use non-oil based sweeping compound to control airborne dust.
- B. Treat oil spots with oil remediation system specified.

- C. Scrub floor with scrubber machine and appropriate brushes or pads and pH compatible detergent specified.
- D. Examine surfaces receiving burnishing process, densifier, and stain protector. Verify that surfaces conform to product(s) manufacturer's requirements for substrate conditions.
- E. Vacuum and clean saw cut joints and surrounding area so that no dust remains to react with concrete finish material.
- F. Remove any foreign materials prior to application of burnishing process, densifier, and stain protector. Remove compound by cleaning and scrubbing in accordance with manufacturer's instructions.
- G. Prior to burnishing application, scrub floor with water to remove latent salts. Do not proceed until unsatisfactory conditions have been corrected.
- H. Beginning of application indicates acceptance of existing conditions.

3.6 BURNISHING APPLICATION

- A. Commencement of work by the Flooring Subcontractor constitutes an acceptance of existing conditions by the contractor.
- B. The following procedures are the chronologically ordered steps to accomplish the specified slab final finish. Application procedure may vary due to unique project conditions including – but not limited to - hardness of concrete. Do not use any burnishing pad that may damage the concrete slab surface prior to strength development at any given time of the burnishing/densification process. Procedures used to accomplish approved mock-up shall prevail. Conformance or deviation from the following steps does not remove Subcontractor from providing the specified finish.
 - 1. Clean slab using High pH cleaner specified, and pads as recommended by manufacturer, rinse slab as required by manufacturer.
 - 2. Before cleaning, apply joint fillers and repair holes in slab as required to provide a smooth finish.
 - 3. Before, between and after final wet burnishing passes, thoroughly scrub and rinse slab surface with clean water (high pH Cleaner) and vacuum with auto-scrubber machine.
 - 4. Dry burnish in a slow movement pace using a propane Burnishing Machine with 800-grit Diamond Impregnated Pads (DIPs) or higher DIPs, dry application. The number of passes for the will vary based on the condition of the slab and the requirements to attain the desired final Finished Gloss levels as specified.
 - 5. Provide caulk, patch and joint sealant touch up as required to provide smooth finish. Reference applicable sections for approved repair and grout material.
 - 6. Thoroughly vacuum and clean slab per manufacturer's recommendations prior to the application of stain protection product.
 - 7. Reburnish slab with 3000-grit Diamond Impregnated Pads or Natural Hogs Hair

pads to reach specified gloss levels.

C. Finished Gloss Level:

1. Finished Gloss Level:

a. Reflective Sheen Rating: Average between 20-30 per ASTM D523 prior to stain protector application.

2. Flooring Subcontractor to verify gloss level readings with Gloss Meter (General Contractor to assist in readings). Provide photos of the readings attained at minimum of (2) locations throughout Receiving and sprinkler rooms to the General Contractor for the owner. Identify locations tested on photos. Gloss level reading to be performed at the end of the burnishing process.

D. Final Aggregate Exposure:

1. Concrete Polishing Association of America (CPAA) Class A, Level 1 Shine, Cream.

3.7 DENSIFIER APPLICATION

A. Area to be Treated: Apply densifier to all interior burnished concrete floors as indicated on Drawings. Densifier to be applied between grinds as indicated in the Burnished Section of this specification.

B. Application:

1. Application shall be performed by a certified applicator in accordance with manufacturers published instructions.
2. Schedule to begin minimum 28-days after floor slab placement.
3. Employ methods to ensure concrete surface is not damaged during application, including discoloration.
4. Apply the densifier finish at the rate recommended by manufacturer.
5. Apply with low pressure sprayer with conical tip with enough coverage to keep concrete surface wet for minimum 20-minute period.
6. Reapply densifier to rejection.

3.8 FLOOR PROTECTION

A. General Contractor to use reasonable care before, during and after the construction process to protect the finished floor from construction traffic and weather until time of Owner Possession. Protection includes but is not limited to maintaining the gloss levels attained by Flooring Subcontractor.

B. General Contractor to use reasonable care before, during and after the construction process to prohibit caustic chemicals and materials, acids, and acidic detergents to come in contact with slab.

- C. General Contractor to use reasonable care before, during and after the construction process to maintain cleanliness of the finished polished concrete floor until time of Owner Possession.

3.9 PRODUCT DISPOSAL

- A. Upon completion of densifier and stain protector application, Flooring Subcontractor to dispose of excess material as required by local agency having jurisdiction.
- B. Flooring Subcontractor shall remove densifier and stain protector product containers from job site immediately upon completion of treatment.

3.10 MAINTENANCE PROCEDURES

- A. Flooring Subcontractor to provide General Contractor with Maintenance Guide for maintenance of burnished floors.
- B. Flooring Subcontractor to provide 5-Gallon Pail of Ameripolish Multipurpose Rejuvenating Cleaner as specified for store maintenance team.
- C. Maintenance Meetings: General Contractor to conduct meeting with Flooring Subcontractor prior to maintenance procedures to verify project requirements, manufacturer's maintenance instructions and manufacturer's warranty requirements as applicable. A manufacturer's representative shall be included in maintenance meetings. General Contractor to provide all documentation on warranty and maintenance to Owner.
- D. General Contractor and owner to utilize maintenance system, chemicals, and other related sundries as recommended by chemical products manufacturer, for maintenance of floor surface.

END OF SECTION 033565

SECTION 034500 - PLANT-PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Precast concrete units in the following applications:

1. Sill.
2. Cap.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

- B. ASTM International (ASTM):

1. ASTM A 82 - Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A 496 - Steel Wire, Deformed for Concrete Reinforcement.
3. ASTM A 615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
4. ASTM C 33 - Concrete Aggregates.
5. ASTM C 144 - Aggregate for Masonry Mortar.
6. ASTM C 150 - Portland Cement.
7. ASTM C 260 - Air-Entraining Admixtures for Concrete.

- C. American Concrete Institute (ACI):

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.

- D. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI - Manual of Standard Practice

- E. Precast / Prestressed Concrete Institute (PCI):

1. PCI MNL 117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.
2. PCI MNL 120 - Design Handbook – Precast and Prestressed Concrete

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: Provide drawings prepared by the applicator / contractor showing the wall layout, typical details, connections, expansion joints, plus the installation sequence. Shop drawings shall

include the following:

1. Submit elevations, sections, and details of assembly components; indicate locations, configurations, large scale plans.
2. Show sequence of installation, attachment details, and weather sealing.

C. Warranty: Copy of manufacturer's standard warranty.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect plant-precast architectural concrete products in compliance with the requirements of Section 016000 and manufacturer's recommendations.
- B. Store units at Site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Reinforcing:
 1. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
 2. Plain-Steel Wire: ASTM A 82.
 3. Deformed-Steel Wire: ASTM A 496.
- B. Concrete: Portland Cement: ASTM C 150, Type I or Type III of same type, brand, and source.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

2.2 CONCRETE MIXES

- A. Proportion mixes 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.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- B. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.

- C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

2.3 FABRICATION

- A. Design Standards: Comply with ACI 318 and the design recommendations in PCI MNL 120.
- B. Quality-Control Standard: Comply with PCI MNL 117.
- C. Cast concrete units in size and shape as indicated on drawings.
- D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.
- E. Reinforce precast architectural concrete units to resist handling, transportation, and erection stresses.
- F. Mix concrete according to PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.
- G. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 117.
- H. 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.
- I. Discard precast architectural concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Architect.
- J. Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.
- K. Fabricate sill and wall cap in nominal dimensions, allowing for 3/8-inch mortar joints.

2.4 FINISHES

- A. Finish exposed surfaces of precast architectural concrete units to a smooth surface finish free of pockets, sand streaks, and honeycombs, with uniform color and texture. Chamfer exposed edges of wall cap and sills.
- B. Color: Standard white (limestone), unless noted otherwise.

2.5 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lay units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints. Remove excess mortar.
- B. Dowel units into place as shown on the Drawings.
- C. Maintain courses to uniform width. Align vertical joints. Provide joints of equal and of uniform thickness.
- D. Tool bed joints concave. Use tool with large enough radius, that joint is not raked free of mortar.
- E. Rake the head joints (top and sides) to a depth equal to the joint width.
- F. Apply joint sealant to head joints. Prior to sealing, install a bond breaker tape against the remaining mortar to prevent three-sided bonding of sealant. Use type 1 or 3 polyurethane sealant and bond breaker tape conforming to Section 07900. Match sealant color to mortar color.
- G. Install precast architectural concrete units level, plumb, square, true, and in alignment without exceeding the non-cumulative erection tolerances of PCI MNL 117, Appendix I.
- H. Seal sill units as shown in accordance with Section 079200 with sealant color to match mortar.
- I. Clean exposed surfaces of precast concrete units after erection to remove markings, dirt, and stains.

END OF SECTION 034500

SECTION 034713 - TILT-UP CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes load-bearing, tilt-up concrete, monolithic panels.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Concrete Design Mixtures:
 - 1. Mill test reports.
 - 2. Concrete Aggregate designation, type, quality, and source.
 - 3. Sieve analysis.
 - 4. Concrete Aggregate Supplier Statement.
 - 5. Product data for concrete admixtures.
 - 6. Concrete compressive strength data.
- C. Shop Drawings: Detail fabrication and installation of tilt-up concrete units. Indicate panel locations, plans, elevations, dimensions, shapes, cross sections, and details of steel embedments. Match panel identification designations on Shop Drawings with those on Contract Drawings.
 - 1. Include steel reinforcement, detailing fabrication, bending, and placing.
 - 2. Include additional steel reinforcement to resist hoisting and erection stresses.
 - 3. Include locations and details of hoisting points and lifting devices for handling and erection.
 - 4. Panel books shall be reviewed by the Structural Engineer. Revisions required due to non-compliance with the Contract Drawings shall not be passed to the Owner.
- D. Brand name, chemical composition, installation directions and certificates of compliance for the following:
 - 1. Bond Breaker.
 - 2. Curing Compound.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer, testing agency.

- B. Welding certificates.
- C. Material certificates.
- D. Material test reports.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Installer Qualifications: A qualified installer who employs a supervisor on Project who is an ACI-certified Tilt-up Supervisor.
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.4/D1.4M.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete mixtures.

PART 2 - PRODUCTS

2.1 TILT-UP CONCRETE

- A. Comply with ACI 301, unless modified by requirements in the Contract Documents.

2.2 FORMS AND ACCESSORIES

- A. Forms: Metal, dressed lumber, or other approved materials that are nonreactive with concrete and that will provide continuous, true, and smooth concrete surfaces.
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch.

- C. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.
- D. Reveal Strips: Metal, PVC, rubber, straight dressed wood, or plywood; with sides kerfed.
- E. Joint Fill: Provide temporary joint fill in joints of casting-slab at locations where tilt wall panels are to be cast. Temporary joint fill to provide a smooth surface for casting of tilt walls.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- C. Plain-Steel Wire: ASTM A82/A82M, as drawn.
- D. Plain-Steel Welded-Wire Reinforcement: ASTM A185/A185M, fabricated from as-drawn steel wire into flat sheets.
- E. Deformed-Steel Welded-Wire Reinforcement: ASTM A497/A497M, flat sheet.
- F. Bar Supports: Manufactured according to CRSI's "Manual of Standard Practice" of plastic or CRSI Class 1 plastic-protected steel wire or Class 2 stainless-steel wire.

2.4 CONCRETE MATERIALS

- A. Cementitious Material:
 - 1. Portland Cement: ASTM C150/C150M, Type I, gray.
 - 2. Fly Ash: NO Fly Ash allowed in Tilt-up panels.
- B. Coarse Aggregate: ASTM C 33/C 33M, coarse aggregate or better, graded. Provide aggregates from single source.
 - 1. Maximum Coarse-Aggregate Size: 1-inch nominal.
- C. Air-Entraining Admixture: Not permitted.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Water: ASTM C 94/C 94M and potable.

2.5 BOND BREAKERS

- A. Waterborne, Chemically Reactive and Membrane Forming Bond Breaker: Penetrating polymerized low VOC compliant emulsion containing no oils, waxes, paraffins, and MUST be compatible with casting-slab curing compound.
 - 1. Nox-Crete: Silcoseal Select Cure and Bond Breaker
 - 2. Dayton Superior: Sure Lift J6WB
 - 3. Substitutions allowed only upon approval by Architect.

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Dayton Superior: AquaFilm J74RTU.
 - b. Nox-Crete: Mono-Film.
 - c. Substitutions allowed only upon approval by Architect.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B tested on a hard steel troweled test specimen prepared in accordance with European Standard CEN/TS 14754. Curing compound must be compatible with bond breaker.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Dayton Superior: Clear Resin Cure J11W.
 - b. Nox-Crete: Silcoseal Select Cure and Bond Breaker.
 - c. Substitutions allowed only upon approval by Architect.

2.7 CONNECTION MATERIALS

- A. Embedded Metal Items and Loose Hardware: Comply with Section 055000 "Metal Fabrications" for materials for securing tilt-up concrete panels together and to supporting and adjacent construction.
- B. Loose Hardware: Comply with Section 055000 "Metal Fabrications" for materials for securing tilt-up concrete panels together and to supporting and adjacent construction.

- C. Carbon-Steel Shapes and Plates: ASTM A36/A36M.
- D. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.
- E. Welded Headed Studs: AWS D1.1/D1.1M, Type B headed studs, and cold-finished, carbon- steel bars.
- F. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- G. Welding Electrodes: Comply with AWS standards.

2.8 LIFTING INSERTS AND ACCESSORIES

- A. Furnish inserts, dowels, bolts, nuts, washers, and other items to be cast in panels for tilting and lifting.
 - 1. Manufacture inserts with feet of plastic, galvanized-steel wire, plastic-tipped steel wire, or stainless-steel-tipped steel wire.
- B. Furnish brace anchors and other accessories to be cast in panels and in casting slab for attaching bracing.
 - 1. Manufacture wall brace anchors and accessories with feet of galvanized-steel wire, plastic-tipped steel wire, or stainless-steel-tipped steel wire.
 - 2. Manufacture floor brace anchors that do not penetrate vapor retarder under slab-on-grade.

2.9 BEARING PADS

- A. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet; Type A Shore durometer hardness of 50 to 70, ASTM D 2240; and minimum tensile strength of 2250 psi, ASTM D 412.
- B. Random, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer with a Type A Shore durometer hardness of 70 to 90, ASTM D 2240.
- C. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded in elastomer with a Type A Shore durometer hardness of 80 to 100, ASTM D 2240.
- D. High-Density Plastic Strips: Multimonomer, non-leaching plastic.

2.10 GROUT

- A. Cement Grout: Portland cement, ASTM C 150/C 150M, Type I, and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

- B. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents; complying with ASTM C 1107, of consistency suitable for application.

2.11 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures based on laboratory trial mixtures.
- B. Proportion concrete mixture as follows:
 - 1. Minimum Compressive Strength: 3000 psi or as indicated on Structural Drawings, at 28 days.
 - 2. Maximum W/C Ratio: 0.53.
 - 3. Slump Limit: 5 inches, plus or minus 1 inch.

- C. Admixtures: Use admixtures according to manufacturer's written instructions.

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Construct and brace formwork so tilt-up concrete panels are of size, shape, alignment, elevation, and position indicated.
 - 1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concreting. Coat form liner with form-release agent.

3.2 BOND BREAKER INSTALLATION

- A. Uniformly and continuously apply two coats of bond breaker to casting-slab surfaces by power spray or roller according to manufacturer's written instructions, before placing steel reinforcement. Recoat areas subjected to moisture before drying. Maintain continuity of coating until concrete placement. Additional coats of bond breaker may be required, follow manufacturers recommendations for application process to achieve best results for clean release of panels.
- B. After placing steel reinforcement, touch up or recoat worn or damaged areas with bond

breaker. Do not splash or coat steel reinforcement and inserts.

3.3 REINFORCEMENT AND INSERT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating and placing reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
- C. Accurately place and securely support embedded items, anchorages, inserts, cramps, retainers, bar chords and sleeves, and other items to be built into panels per construction documents. Coordinate with other trades for installing cast-in items.

3.4 PANEL CASTING, GENERAL

- A. Comply with ACI 301 for handling, placing, and consolidating concrete.
- B. Screed panel surfaces to correct level with a straightedge and strike off.
 - 1. Begin initial floating before excess moisture or bleedwater appears on the surface. Use bull floats or darbies to form a uniform and open-textured surface plane free of humps or hollows. Do not disturb panel surfaces before beginning finishing operations.
- C. Form chamfers at top edges of panel perimeters, openings, and similar locations not formed by chamfer strips unless otherwise indicated.
- D. Surface Defects: Limit visible surface defects to those permitted by TCA's "Tilt-up Concrete Association's Guideline Specifications" for Grade A, Architectural panel surfaces.

3.5 CASTING TOLERANCES

- A. Cast tilt-up concrete panels without exceeding the tolerances of TCA's "Tilt-up Concrete Association's Guideline Specifications."

3.6 FACE-UP FINISHES

- A. Float Finish: Consolidate surface of plastic concrete with power-driven floats or by hand floating. Restraighten and cut down high spots and fill low spots. Repeat float passes and restraighten until surface is left with a uniform, smooth, granular texture.
- B. Trowel Finish: After applying float finish, apply first trowel finish and consolidate plastic concrete by hand trowel or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and is uniform in texture and appearance.

3.7 FACE-DOWN FINISHES

- A. Smooth, As-Cast Finish: Cast panel to produce a surface free of pockets, sand streaks, and honeycombs. Produce a surface appearance of uniform color and texture.

3.8 CONCRETE PROTECTING AND CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures according to ACI 301.
 - 1. Apply evaporation retarder in hot, dry, or windy weather to protect concrete from rapid moisture loss before and during finishing operations. Apply according to manufacturer's written instructions after screeding and bull floating concrete, but before float finishing.
- B. Begin curing immediately after finishing concrete. Cure by one or a combination of the following methods according to ACI 308.1:
 - 1. Moisture Curing: Keep surfaces continuously moist for no fewer than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover. Cure for no fewer than seven days.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Reference approved curing compounds in Section 033000.

3.9 ERECTION

- A. Use erection equipment with care to prevent damage to floor slabs and panels.
- B. Contractor is fully responsible for protecting the building slab from aesthetic or structural damage.
 - 1. Placement of cranes on building slab is to be avoided to the fullest extent possible.
 - 2. If conditions prohibit lifting of panels from outside the building perimeter, Contractor shall be responsible for specification, design, and application of slab protection system.
 - 3. Under no circumstances shall cranes be placed on unprotected building slabs.
 - 4. Neither the Owner nor Design Professionals shall accept responsibility for slab protection from crane loading.
 - 5. Aesthetic or structural damage to the slab shall be repaired by the Contractor at no cost to the Owner and no extension to the construction schedule.
- C. Lift, support, and erect panels only at designated lifting or supporting points indicated on Shop Drawings.
- D. Do not erect panels until 75 percent of 28-day compressive strength of concrete has been verified.
- E. Install tilt-up concrete panels level, plumb, square, and true. Place panels on leveled grout- setting pads or shims in correct position. Maintain joint width of 1/2 inch between panels.

1. Install tilt-up concrete panels with face-down surfaces exposed to exterior of building.
- F. Temporarily brace and support panels securely in position against loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to panels are secured.
- G. Anchor panels in place and, if indicated, to one another.
1. Weld steel connectors to steel supports and embedments indicated, complying with AWS D1.1/D1.1M.
 2. Cover all exposed steel with concrete grout as indicated on drawings.
- H. Solidly grout-fill gaps between foundation system and bottom of panels.
- 3.10 FIELD QUALITY CONTROL
- A. Special Inspections: Owner will engage a Special Inspector and qualified testing and inspecting agency to perform tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to submit reports.
- C. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before erection of tilt-up panels.
- D. Testing Services: Tests shall be performed according to ACI 301.
- E. Tilt-up concrete panels will be considered defective if they do not pass tests and inspections.
- 3.11 ERECTION TOLERANCES
- A. Install tilt-up concrete panels without exceeding the erection tolerances in TCA's "Tilt-up Concrete Association's Guideline Specifications."
- 3.12 FILLING AND REPAIR
- A. Patch holes and voids left by erecting and bracing inserts on tilt-up panels and slabs-on-grade. Cut or chip edges of voids perpendicular to concrete surface. Fill block-outs where indicated.

1. Clean, dampen with water, and brush-coat the holes, voids, and block-outs with bonding agent. Fill and compact with patching mortar of a stiff consistency before bonding agent has dried.
- B. Repair damaged galvanized-steel surfaces of connectors by cleaning and applying a coat of zinc repair paint.
- C. Repair damage to tilt-up panels and slabs-on-grade resulting from tilt-up work, as directed by Architect.
- D. Remove and replace tilt-up panels that do not comply with requirements in this Section at no cost to Academy or the owner.

END OF SECTION 034713

SECTION 035413 - PORTLAND CEMENTITIOUS UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes self-leveling, portland cementitious underlayment for application below interior floor coverings.

1.2 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.3 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
 - 1. Place portland cementitious underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENTITIOUS UNDERLAYMENTS

- A. Portland Cementitious Underlayment: Self-leveling, portland cementitious product that can be applied to minimum uniform thickness of 1/8-inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. ARDEX Americas: K-15 Self-Leveling Underlayment Concrete. Ardex, Inc., Aliquippa, PA 15001, PH: 724-203-5000, for conditions where 1/2-inch or more leveling is required.
 - b. Mapei: Planiprep SC. (Skim finish, skim coat patch and finishing underlayment).
 - c. Ardex: SKM. (Skim finish, skim coat patch and finishing underlayment).
 - 2. Cement Binder: Hydraulic cement-based inorganic binder as defined by ASTM C 150: Standard Specification for Portland Cement and other specialty hydraulic cements.
 - 3. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
 - a. ARDEX E25 Resilient Emulsion.
- B. Water: Potable and at a temperature of not more than 70 deg F.
- C. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
 1. Primer Standard Porous Concrete: ARDEX P 51 Primer.
 2. Primer Non-porous substrates, ceramic & quarry tile, non-water-soluble adhesive residue, concrete treated with silicate compounds, metal, and wooden subfloors: ARDEX P 82 Ultra Prime.
- D. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for the type of floor covering to be applied to underlayment.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 2. Saw Cuts and Control Joints – fill all non-moving joints with ARDEX ARDIFIX Joint Filler or ARDEX SD-F FEATHER FINISH as recommended by manufacturer.
 3. Fill substrate voids to prevent underlayment from leaking.
- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
 1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate required by the floor covering manufacturer.
- C. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond; prepare surfaces according to manufacturer's written instructions.
- D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.2 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 - 2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply underlayment to produce uniform, level surface.
 - 1. Apply a final layer without aggregate to product surface.
 - 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- F. Apply surface sealer at rate recommended by manufacturer.
- G. Remove and replace underlayment areas that evidence a lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

END OF SECTION 035413

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SECTION 039050 –CONCRETE REPAIRS AND JOINT FILLER

REPLACEMENT PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior concrete slab repairs for existing concrete floor slabs when required, in preparation for existing slab polishing in accordance with Sections 033560 or 033565, including:
 - a. Joint filler removal and replacement.
 - b. Joint edge spall repair.
 - c. Crack repair.
 - d. Surface defect repair, including pop-outs, chips, spalls, and pitting.
 - e. Removal and replacement of previously completed repairs not in compliance with this section.

B. Related Requirements:

1. Section 013300 – Submittal Procedures
2. Section 017419 - Construction Waste Management and Disposal
3. Section 015000 – Temporary Facilities and Controls
4. Section 033560 – Modified Polished Concrete Floor Finishes
5. Section 033565 – Burnished Concrete Floor Finishes

1.2 REFERENCES

A. Occupational Safety and Health Administration (OSHA):

1. OSHA 01926.1153 Respirable Crystalline Silica.

1.3 ENVIRONMENTAL REQUIREMENTS

- A. Minimize dust emissions and provide equipment that suppresses dust.
- B. Dispose of construction waste in accordance with the Contract requirements referenced in Section 017419 – Construction Waste Management and Disposal, and as required by regulatory agencies.
- C. Comply with current Federal, state, and local air quality regulations and with Federal requirements on concrete silica dust emissions.

1.4 SUBMITTALS

A. Product data and Material Safety Data Sheets (MSDS):

1. All products, and primary equipment used for repair of existing concrete slab defects.

B. Joint Filler and Slab Repair Subcontractor Requirements:

1. Joint Filler and Slab Repair Subcontractor Qualifications: Provide to General Contractor for submittal a list of a minimum of 5 projects performed within the last 2 years of similar type, size, and complexity as this contract. Provide project names, addresses, contact names, phone numbers, and scope of work for each project at time of Bids.

1.5 QUALITY ASSURANCE

A. Environmental Requirements:

1. All replaced concrete shall be cured a minimum of 28 days prior to joint filler installation.
2. Close finished slab area to traffic during application and after application for a time as recommended by manufacturer.
3. Upon completion of densifier application, dispose of excess materials.

1.6 CONTRACTOR RESPONSIBILITIES – INTERIOR SLAB SURFACE ENHANCEMENT

- A. Provide temporary electrical service for floor equipment as specified in Section 01500.
- B. Coordinate disconnecting and reconnecting electrical power to existing equipment and fixtures which are scheduled to be moved for installation of flooring.
- C. Attend Pre-Possession meeting to advise in development of flooring installation and finishing schedule (Floor Phasing Plan and Schedule).
- D. Coordinate slurry storage fencing and monitoring as required herein.

1.7 DELIVERY, STORAGE, AND HANDLING – INTERIOR SLAB SURFACE ENHANCEMENT

- A. Transport, handle, store, and protect products in compliance with the requirements in Division 1 and manufacturer's recommendations.
- B. Deliver materials to site in original, factory sealed, unopened, new containers (drums) bearing manufacturer's name and label intact and legible, with the following information:
 1. Name or title of material.
 2. Manufacturer's standard container (drum) numbers.
 3. Application instructions.
- C. Storage:
 1. Refer to Section 015000.
 2. Store materials in protected and well-ventilated area at temperatures between
 3. 40- and 90-degrees F unless otherwise required by manufacturer.
 4. Keep containers sealed until ready for use.
 5. Do not use materials beyond manufacturer's shelf-life limits.
- D. Handling: Protect materials during handling and application to prevent damage or contamination.
 1. Dispense penetrating liquid densifier only from factory sealed and numbered containers (drums).
 2. Maintain record of container (drum) numbers received and used during floor treatment.

PART 2 – PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS – INTERIOR CONCRETE SLAB REPAIRS

- A. Subject to compliance with project requirements, provide floor slab repair products as manufactured by the following:
1. Advanced Blending, (817) 477-8022; www.advancedblending.com
 2. Brulin & Company, (800) 776-7941; www.brulin.com
 3. Hi-Tech Structural Epoxy Systems, (800) 454-5530; www.hitechpolyurea.com
 4. Metzger/McGuire, (800) 223-6680; www.metzgermcguire.com
 5. Prime Resins, (800) 321-7212; www.primeresins.com
 6. Prosoco, (866) 363-4567; www.prosoco.com
 7. Roadware, Inc., (800) 522-7623; www.concretemender.com
 8. SpecChem, (866) 791-8700; www.specchemllc.com
 9. Superior Surface Solutions, (888) 471-5227; www.superiorsurfacesolutions.com
 10. VersaFlex, Inc., (913) 321-1416; www.versaflex.com
- B. Polyurea Joint Filler: Rapid setting, two-component polyurea polymer liquid of 100% solids content, Shore hardness 85-90, compatible with construction materials in contact.
1. HT-PE85, High-Tech
 2. EP 80, by Metzger/McGuire.
 3. VersaFlex SL/85, by VersaFlex.
 4. Match color of adjacent exposed concrete slab surface.
- C. Structural Urethane (low viscosity):
1. 10 Minute Concrete Mender, by Roadware
 2. Spall TX, by High Tech
 3. Rapid ReFloor, by Metzger/McGuire.
 4. Quick Mender, by VersaFlex.
 5. Match color of adjacent exposed concrete slab surface.
- D. Silica Sand
1. Dry 00 Sandblasting sand.
- E. Structural Mortar
1. Armor-Hard Extreme, by Metzger/McGuire.
 2. Dimakrete Polish Mortar, by Superior Surface Solutions.
 3. RepCon 928, by SpecChem.
- F. Surface Pitting Grout
1. Dimakrete Polish Grout, by Superior Surface Solutions.
 2. Quick MenderX.O., by VersaFlex.
 3. Rapid ReFloor Pit Grout, by Metzger/McGuire.

4. Approved equal.

G. High pH Cleaner:

1. Amodet Degreaser/Cleaner by Advanced Blending.
2. Brulin Deep Scrub Cleaner by Brulin & Co.
3. Cleaner/Degreaser by Prosoco.
4. Equivalent approved products.

2.2 EQUIPMENT – INTERIOR CONCRETE SLAB REPAIRS

A. Refer to Section 015000 – Temporary Facilities and Controls for requirements related to acceptable power sources specified herein.

B. Subject to compliance with project requirements, provide floor slab repair equipment manufactured by the following:

1. Gator Finishing Products, (800) 255-4748, www.gatorfinishing.com
2. HTC, (877) 482-8700, www.htc-america.com
3. Joe Due Blades and Equipment, Mauston, WI, (877) 563-3833.
4. Norton Abrasives, (800) 331-3604, www.nortonabrasives.com
5. Pulman-Ermator, (800) 232-2635, www.pullman-ermator.com
6. SASE Company, Inc., Kent, WA, (800) 522-2606
7. U.S. Saws, Santa Ana, CA, (866) 987-7297.
8. [OBHC, Inc. dba Gorilla Concrete Tools](http://www.obhc.com), Columbia Station, OH, (440) 236-5112.

C. Dust Collection Vacuum System: Connect one of the following dust collection systems directly to each tool. Verify that collection system provided is equipped with HEPA-rated filter and is recommended by the manufacturer to maintain dust emissions below the permissible level. Verify air flow speed is acceptable for the size of the blade.

1. 26D, by HTC.
2. S2400, by Pullman-Ermator.
3. Bull 50, by SASE Company, Inc.
4. Similar equipment as required to produce the specified results.

D. Floor Slab Joint Filler Removal and Preparation

1. Humpback Cutter Complete, by Joe Due.
2. Dust Buggy, by U.S. Saws.
3. [Gorilla Concrete Tools](http://www.obhc.com) GCT-10 or GCT-9 Silverback by OBHC, Inc.
4. Similar equipment as required to produce the specified results.

E. Floor Slab Crack Repair:

1. 5-inch Dust Mizer 005, by Joe Due.
2. 7-inch Dust Mizer 007, by Joe Due.
3. Crack Attacker, by Joe Due.
4. 7-inch Handheld Crack Chaser, by Joe Due.
5. SawTec 5-inch Tile Vac, by U.S. Saws.
6. SawTec 7-inch Crac-Vac, by U.S. Saws.

- 7. Similar equipment, as required to produce the specified results.
- F. Floor Surface Grinder: Handheld 5"-7" electric surface grinder with dustless shroud/housing.
 - 1. Dust Avenger 5, by Joe Due.
 - 2. Dust Avenger 7, by Joe Due.
 - 3. SawTec 5-inch Grinder Vac, by U.S. Saws.
 - 4. SawTec 7-inch Grinder Vac, by U.S. Saws.
 - 5. Similar equipment, as required to produce the specified results.
- G. Floor Slab Fiber Stripping Pads
 - 1. Rapid Strip Disc, by Norton
 - 2. Gator Fiber Disc, by Gator Finishing Products
 - 3. Similar equipment, as required to produce the specified results.

PART 3 - EXECUTION

3.1 GENERAL

- A. Concrete rehabilitation work specified in this Section shall be in accordance with the locations and limitations shown on Drawings.
- B. Installation of specified products shall be in accordance with product manufacturer's written instructions.
- C. Verify that sawing and grinding tools are equipped with a dust collection system as specified herein.
- D. For repairs of this Section requiring clean joints of loose concrete, joint filler, laitance, dust, and debris, use a HEPA-rated filter vacuum.

3.2 EXAMINATION – INTERIOR FLOOR SLAB REPAIRS

- A. An evaluation of the existing floor slab shall be conducted, identifying all defects. Scope of repairs shall be confirmed by the Owner's Concrete Consultant prior to commencement of work. Identify scope of work for floor polishing / floor burnishing specified in other section(s) of Division 3 – Concrete and locations as indicated in the Drawings.

3.3 PREPARATION – INTERIOR FLOOR SLAB REPAIRS

- A. Close areas to traffic during and after floor finish application for time period recommended by product manufacturer(s).
- B. Cover and protect merchandise and racking to prevent damage or contamination of stored products. Provide dust drapes as required to protect merchandise from dust or debris.
- C. Protect surface of slab immediately adjacent to defect under repair.
- D. Do not proceed until Owner's Construction Manager has approved repair material match.

3.4 INTERIOR FLOOR SLAB SURFACE ENHANCEMENT

- A. Slurry Storage Monitoring:

1. Unlock slurry fence area during daytime hours for slurry disposal pickup.
2. Monitor and report incidents on any qualifying spills.

B. Clean Substrate: Remove existing floor finishes to bare concrete slab.

1. Do not use hazardous materials or flammable, toxic, or solvent-based cleaning products.
2. Remove curing or sealing compounds, paint, and wax.
3. Remove surface contaminants such as oil, grease and general soiling with high pH cleaner/de-greaser diluted as recommended by manufacturer using swing machine with red or black pads. Use appropriate pad to achieve desired results while not exposing coarse aggregate or excessive sand within paste layer.
4. Thoroughly rinse floor surface with clean water to remove soap residue and contaminants. Vacuum with auto scrubber.
5. Squeegee dry.

C. Remove and replace existing deficient joint filler within the limits of required slab polishing and as shown on Drawings, in accordance with the requirements herein.

D. Repair slab defects within the limits of required slab polishing in accordance with the requirements herein. Correct previous repairs not conforming to requirements herein, including any repairs not matching adjacent slab surface, in accordance with the requirements herein.

1. Coordinate full scope of concrete slab repair work with Owner's Construction Manager.

E. Verify floors are free of excessive moisture and dusting.

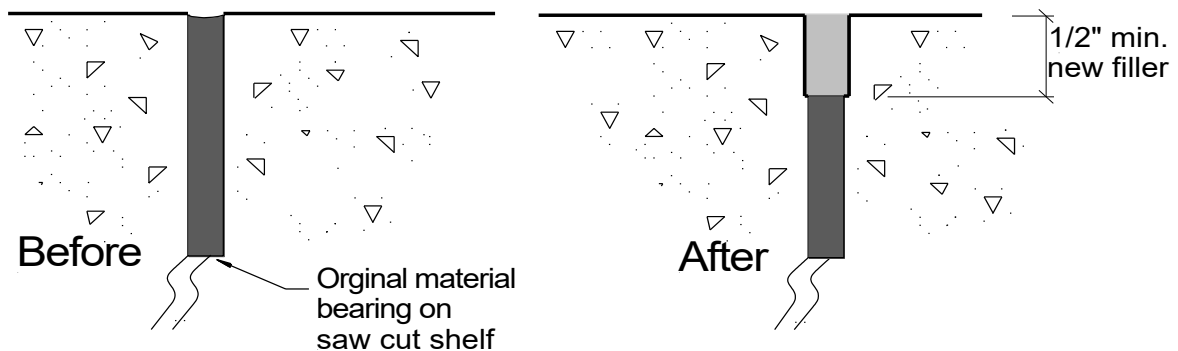
F. Verify that surfaces conform to the manufacturers' requirements for substrate conditions. Do not proceed until unsatisfactory conditions are corrected.

G. Complete joint replacement and slab repair work at least 12 hours prior to commencement of any wet polishing.

H. Cleaning:

1. Remove spilled, splashed, or splattered finish material from surfaces.

3.5 JOINT MILLING AND CAP FILLER REPLACEMENT

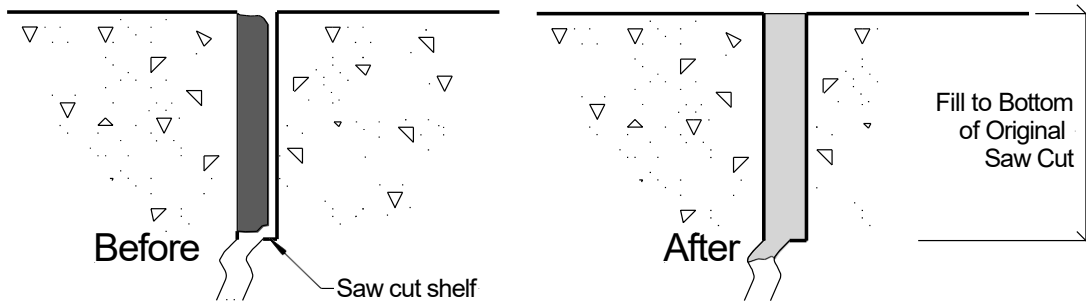


- A. If existing joint filler is sound and resting on top of saw cut shelf, mill top 1/2-inch of material and refill with specified polyurea joint filler:

- B. Re-saw the joint to a minimum depth of 1/2-inch, with a dry-cut, vacuum-equipped saw using a slightly oversized blade. The blade width should be sufficient to encapsulate the widest spall along a given contraction joint segment to produce a sharp corner on each side of the joint with a minimum of two passes through the joint.

- C. Refill with polyurea joint filler material from the bottom up, taking care not to entrap large air bubbles per manufacturer's recommendation. Slightly overfill and shave flush to the surface, prior to grinding process.
- D. Ensure that after grinding, the joint is cut smooth and flush with the finish floor surface, without concave or intermittent, darkened profile.

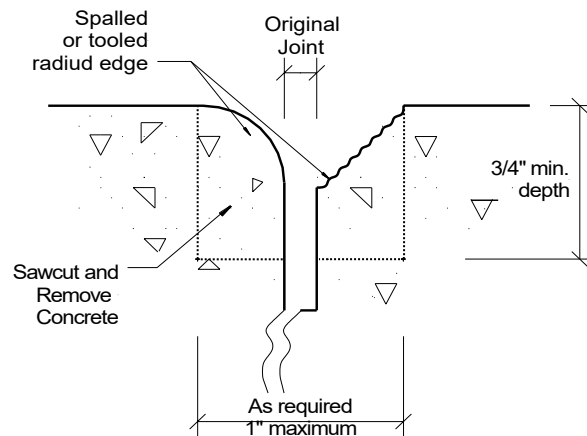
3.6 FULL DEPTH JOINT FILLER REPLACEMENT



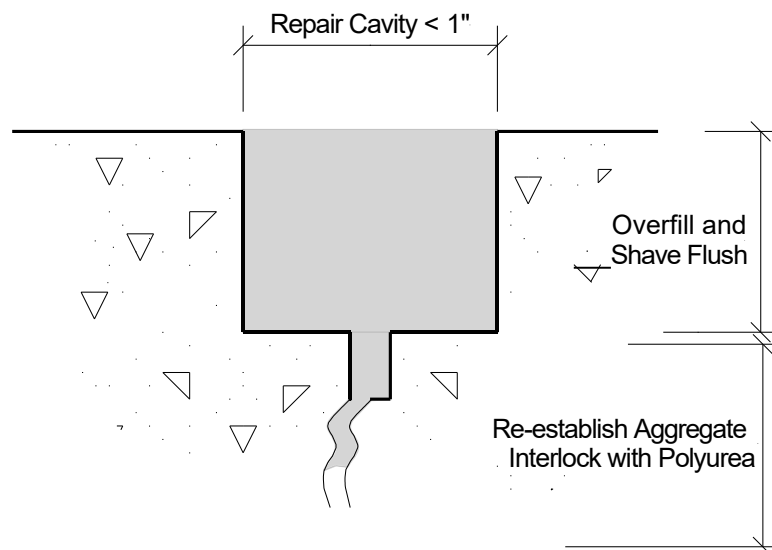
Note: if shelf width at base of saw cut is less than 1/4" on either side of joint, minimum required filler depth is 2" placed over compressible backer rod or bagged silica sand.

- A. If existing joint filler is loose, easily removed, or able to be forced downward with a hand tool, remove all filler material from joint and refill.
- B. Re-saw joint full depth with a dry-cut, vacuum-equipped saw using a slightly oversized blade. The blade width should be sufficient to encapsulate the widest spall along a given contraction joint segment to produce a sharp corner on each side of the joint with a minimum of two passes through the joint. Remove all filler material, debris, and laitance.
- C. If shelf width at base of saw cut is less than 1/4-inch on either side of joint, fill joint with compressible backer rod to not more than 2-inches below slab surface.
- D. Refill with polyurea joint filler material from the bottom up, taking care not to entrap large air bubbles per manufacturer's recommendation. Slightly overfill and shave flush to the surface prior to grinding process.
- E. Ensure that after grinding, the joint is cut smooth and flush with the finish floor surface, without concave or intermittent, darkened profile.

3.7 CONTROL JOINT REPAIR (LESS THAN 1")



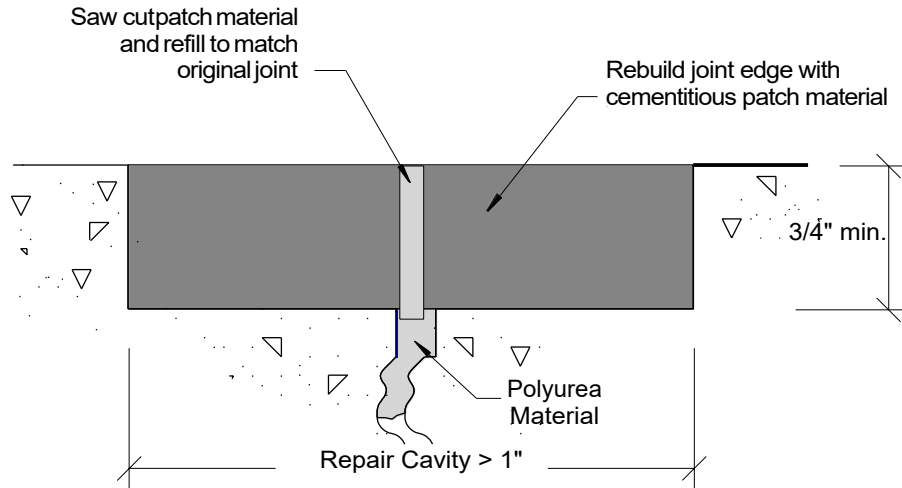
- A. For joints that are spalled or have radius tooled edges not exceeding 1-inch in width at slab surface.
- B. Re-saw the joint edge to a minimum depth of 3/4-inch with a dry-cut, vacuum-equipped saw allowing removal of the widest spall (or top of radius) along a given joint segment to produce a sharp corner on each side of the joint with a minimum of two passes through joint.
- C. Clean joint of loose concrete, joint filler, laitance, dirt, debris, backer rod, etc.
- D. Joints must be free of all visible moisture.
- E. Ensure filler penetrates the irregular aggregate interlock portion of the sawn contraction joint as shown below, re-establishing the aggregate interlock that may have been lost due to shrinkage, curling, and lack of reinforcement.



- F. Gravity feed a trace amount (1/8-inch) of silica sand into joint to prevent 3-sided bonding of joint filler. Use proper dust control methods in handling silica sand.

- G. Fill joint cavity per manufacturer's instructions, taking care not to entrap large air bubbles. Overfill joint slightly and shave flush to slab surface prior to grinding process.

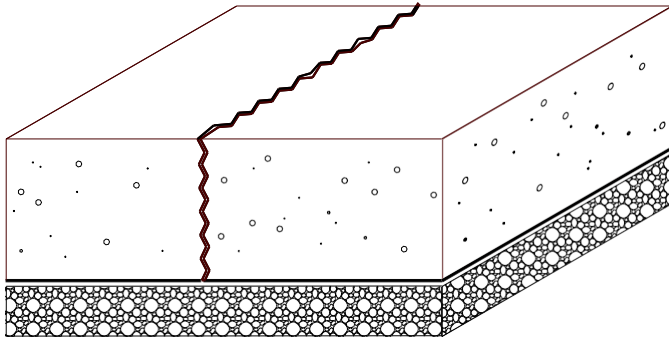
3.8 CONTROL JOINT REPAIR (GREATER THAN 1-inch)



- A. For control joints that exceed 1-inch in width at slab surface or where the slab displays height differential greater than 1/4-inch at either side of joint.
- B. Re-saw the control joint edge to a minimum depth of 3/4-inch with a dry-cut, vacuum-equipped saw allowing removal of the widest spall along a given joint segment to produce a sharp corner on each side of the joint with a minimum of two passes through joint. Maintain consistent width of repair to within 1/2-inch in 10 feet.
1. For construction joints experiencing 1/4-inch or greater height differential at abutting joint edges, repair material should slope at 1/4-inch per foot at floor surface.
- C. Acceptable Patch Materials
1. Structural Mortar installed in accordance with manufacturer's recommendations.
 2. Sand Modified Structural Urethane:
 - a. Place 1/2-inch layers of dry Silica Sand in bottom of spalled cavity.
 - b. Pour structural urethane material over sand until sand is slightly covered.
 - c. Repeat 1/2-inch blended layers of sand and structural urethane material until slightly over-filled above finished concrete surface.
- D. Allow patch material to dry (drying time will vary based on temperature).
- E. Overfill repair cavity with patch material per manufacturer's instructions and grind flush to slab surface.
- F. Use hand grinder with Fiber Stripping Pad to hone over-fill level to adjacent slab surface.
- G. After patch material has cured, and prior to any traffic on patched surface, re-saw original slab joint(s) and fill with polyurea joint filler per manufacturer's instructions.

H. Polish or burnish repair material to match adjacent slab surface after material has properly cured.

3.9 CRACK REPAIR

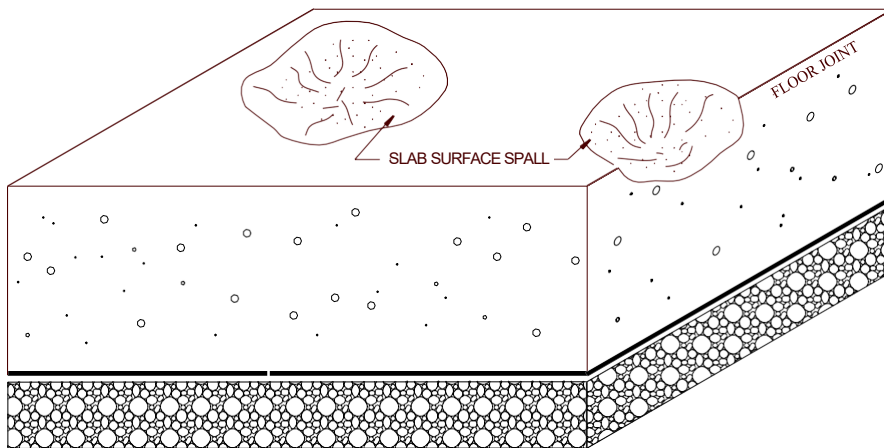


- A. Crack width less than 1/32-inch without surface spalling.
 - 1. Do not repair.
- B. Cracks from 1/32-inch to 3/8-inch in width.
 - 1. Clean crack cavity.
 - a. Remove loose concrete, dirt, and debris from crack with a wire brush or hand grinder with twisted wire wheel attachment, 1/2-inch minimum depth, insuring crack sidewall is clean.
 - b. Remove any loose segments, including islands formed by crack, with sharp tool.
 - c. Use methods that will not widen existing crack.
 - d. Vacuum crack to remove all dirt, debris, and other laitance.
 - 2. Mask slab surface along crack as necessary to minimize overfill.
 - 3. Choose material color that closely matches the adjacent floor.
 - 4. Install low viscosity rigid urethane repair material in accordance with manufacturer's instructions.
 - 5. Repeat until all voids are filled and material crowns slab surface.
 - a. Do not flood area around crack.
 - b. Watch for bubble formation and out gassing.
 - c. Do not allow material to gel before adding additional material.
 - 6. Shave or grind material flush to surface as stipulated by manufacturer.
- C. Cracks from 3/8-inch to 1-inch in width
 - 1. Saw top or edge of crack to provide square edge, minimum 3/4-inch in depth.
 - a. Use a small hand grinder with a maximum 5-inch diameter blade, minimizing eventual crack width while maintaining uniformity of shape.
 - 2. Clean crack cavity.
 - a. Vacuum crack to remove all dirt, debris, and other laitance.
 - b. Remove all visible moisture.
 - 3. Mask slab surface along crack as necessary to minimize overfill.

4. Install polyurea joint filler.

- a. Dispense sample into small bucket to test blending of material.
 - b. Prime crack with repair material.
 - c. Dispense material, dragging dispenser tip along crack, until it flows over the slab.
5. Wait approximately 10 minutes, periodically checking for material cure.
 - a. Check condition of material by shaving with razor scraper.
 - b. Material will shave smooth when cured.
 - c. Proper timing is crucial.
 - 1) Too long and material will be difficult to shave.
 - 2) Too soon and material will ravel.
6. Shave material flush to slab surface per manufacturer's instructions.

3.10 SURFACE SPALLING REPAIR



- A. Route edge of spall to provide 1/2-inch-deep square edge.
 1. Use a small hand grinder with maximum 5-inch diameter dry diamond blade and vacuum system attachment.
 2. Do not overcut slots into existing slab surface.
- B. Clean and prep spalled cavity.
 1. Wire brush the spalled surface to remove all dirt and laitance.
 2. Mask slab at perimeter of spall with tape.
- C. Install low viscosity rigid urethane repair material using tube cartridge without flow restrictor.
- D. Polish over repair area with diamond disks to blend surface.
 1. Feather filler material into the adjacent concrete floor surface.
 2. With 2000-grit disk and firm pressure, add a few burn marks to mottle surface to blend with adjacent floor surface.
- E. NOTE: For spalled joints, a form material may be needed to temporarily support vertical face

of spalled joint edge. Ensure that the repair material will not adhere to the form.

3.11 BOLT HOLE/SPALL REPAIR

- A. Recess steel bolt a minimum of 1/2-inch below finish floor by either punching or cutting.
- B. For spall fracture edge less than 30 degrees, square edge to a minimum 3/8-inch depth with either a drill bit or chisel.
- C. For surface spalls resulting from removal of transition strips, use hollow core drill bit to remove surrounding concrete spall to nominal depth of 1/2-inch. Adjacent repairs shall be of a consistent diameter (max repair size 1-inch nominal).
- D. Clean cavity of all debris and laitance with drill activated brass wire wheel. Vacuum hole to remove all dirt, debris, and other laitance.
- E. Dispense low viscosity rigid urethane at moderate pace using steady pressure. Dispense material into void, refilling as necessary to produce slight crown.
- F. Grind material flush to slab surface per manufacturer's instructions.

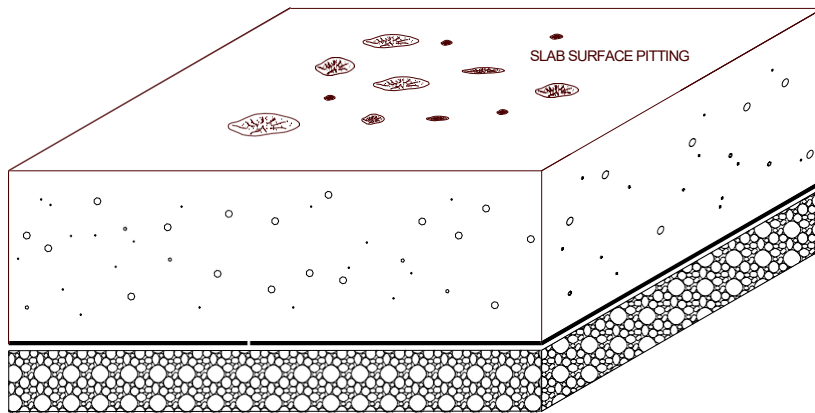
3.12 LARGE SURFACE REPAIR

- A. Edge perimeter with diamond masonry wheel to produce sharp edge, at least 3/8-inch deep.
- B. Roughen base surface and vacuum clean. Wire brush to remove any small loose material and vacuum again.
- C. Protect adjacent slab surface with tape at perimeter of repair area, width as required to prevent scratching during troweling operations.
- D. Mist floor surface until damp but without standing water.
- E. Prepare slurry prime coat of polymerized Portland cement compound and scrub into repair surface with stiff bristle brush. Do not allow to dry before placing pigmented repair material. Use of concrete bonding agent optional.
- F. Mix repair material in accordance with manufacturer's instructions.
- G. Place repair material in floor surface defect and float level. Use float on edge as using flat will cause material to stick and pull.
- H. Lightly mist floated repair material with the finishing aid once and perform first troweling pass to smooth surface without over-working; do not reapply finishing aid during any other troweling operations.
- I. Wait until material begins to set and can be indented with finger about 1/8-inch and perform second troweling pass, approximately two hours after initial placement.
- J. Using a fine sharp edged cutting tool, cut along edge of repair material and adjacent slab to prevent raveling of edge during tape removal, or remove tape earlier before material has set up all the way to prevent raveling or spalling.
- K. When material has become stiff and can be slightly indented with hard finger pressure, final

trowel using firm pressure until mottling and a shine has become apparent. Surface should be tight, level, and smooth without surface defects. Do not allow trowels to be positioned on surface flat, as surface will tear. Use circular sweeping motions. Final set should be around 4-5 hours from time of placement.

- L. Keep surface clean during troweling operations to prevent any laitance from coming in contact with the repair material and marring surface.
- M. Check material set after 30 minutes to 1 hour. Surface should not dent with fingernail under hard hand pressure.
- N. Dye and polish or burnish repair material to match adjacent slab surface after material has properly cured.
- O. Remove tape and clean area of all particles on repair surface and adjacent floor surface.
- P. Re-establish original concrete slab joints by sawing completely through patch and re-filling with polyurea joint filler prior to exposure to traffic.

3.13 SURFACE PITTING REPAIR



- A. This repair is to be used in areas where the number of minimum 1/4-inch size diameter slab pits exceeds eight per square foot.
- B. Using high pH cleaner, scrub slab surface using swing machine with stiff brush, to loosen ground in soils in all pits.
- C. Rinse slab surface with clean water and vacuum up with auto scrubber.
- D. Use specified "Surface Pitting Grout" material after first grind.
- E. Follow manufacturer's instructions regarding procedures.
- F. Repeat repairs in areas as required, if repair material pulls out of defects. Allowing a longer curing time typically minimizes material pull out.

3.14 SLAB LEVELING OR JACKING

- A. Reference Floor Finish Plan for the necessary locations of repairs for joint undersealing.
- B. Submit all procedures and products to consultant for review and approval prior to starting work.
- C. Develop template to position drill bit 12-inches from joint and no further than 18-inches on-center. Holes must be uniformly spaced and staggered across joint (see detail).
- D. Drill 3/8-inch diameter hole full depth through slab.
- E. Remove all remaining debris from drilled cavity with vacuum and proper attachments.
- F. Pump specified polyurethane grout into void between road base and slab base in accordance with manufacturer's recommendations.
- G. Monitor slab for vertical movement with Dipstick or other elevation monitoring device. Vertical slab movement greater than 0.125-inch is not permitted.
- H. Continue to inject polyurethane grout until adjacent holes or joints exhibit blow back.
- I. Shave off excess material.
- J. Drill 7/16-inch diameter hole, 3/4-inch deep, and fill with two-part rigid urethane and grind shave or flush to adjacent surface.
- K. Contractor is to provide 12-Month warranty against differential faulting recurring that is greater than 0.010-inches.
- L. Rigid urethane cap material to be polished flush and seamless to surface. The replacement material color shall be approved from samples provided.

3.15 PROTECTION – INTERIOR FLOOR SLAB REPAIRS

- A. Protect surfaces of finished floor.
- B. Prohibit traffic until floor repairs have received final approval by Owner.

3.16 FINAL CLEANING AND PROTECTION BY GENERAL CONTRACTOR – INTERIOR SLAB SURFACE ENHANCEMENT

- A. Protect newly repaired concrete at all times during construction to prevent oils, dirt, metal, excessive water, paint, and other potentially damaging materials from contacting the concrete surface. Initiate the following protective measures immediately after completion of the work.
1. Communicate to Store Manager and subcontractors, vendors, and trades the importance of maintaining slab protection.
 2. Protect slab surface from moisture for 24 hours.
 3. Inspect equipment used over completed slab surface. Verify the following:
 - a. Equipment is without leaking hydraulic lines and is diapered to avoid staining. Remove all equipment with hydraulic fluid leaks from store site.
 - b. Equipment is without tire embedments (rocks, nails, screws, etc.) that will scratch or pit slab surface.
 - c. Equipment is clean and free of dust prior to start of work requiring equipment.
 4. Prevent contact with acids and acidic detergents.
 5. Use breathable drop cloths during all painting. Immediately wipe clean spilled paint.
- B. Damage to repaired slab resulting from lack of protection shall be at the cost of Contractor.

3.17 FIELD QUALITY CONTROL

- A. Field quality control shall be the responsibility of the Contractor in accordance with Section 014000. Except as specified as mandatory, field quality control testing and inspection shall be at the discretion of the Contractor as necessary to assure compliance with Contract requirements.

END OF SECTION 039050

INTERIOR CONCRETE SLAB REPAIR AND JOINT FILLER REPLACEMENT SUBMITTAL FORM

Section 03905 – INTERIOR CONCRETE SLAB REPAIRS AND JOINT FILLER REPLACEMENT

Date _____

STORE INFORMATION

STORE # _____

ADDRESS _____

S _____

CITY, ST _____

GENERAL CONTRACTOR _____

JOINT FILLER & SLAB REPAIR _____

SUB-CONTRACTOR _____

JOB SITE PHONE _____

A. **ATTACHMENTS:** Include the following with this Submittal Package.

- ☐ Completed Interior Concrete Slab Repair and Joint Filler Replacement Qualification Statement of Conformance.
 - ☐ Letter of Certification for Joint and Slab Repair Material and
 - ☐ Installation. Product data.
 - ☐ Manufacturer and model of all equipment used, relating to scope
 - ☐ of work. Anticipated start and finish date of work:
Size, location, and anticipated progression of individual nightly work areas, forecasted two weeks out from the current date of submittal.
Location of all joint filler replacement, cracks, spalls, and other surface defects requiring repairs specified herein.
Electrical supply locations.
-

INTERIOR CONCRETE SLAB REPAIR AND JOINT FILLER REPLACEMENT QUALIFICATION
STATEMENT OF CONFORMANCE
SECTION 03905

Project Location: _____ Date: _____

Project Number: _____ Store Number: _____

By signing below as approved, the Contractor hereby confirms that the qualifications of the joint filler and slab repair, subcontractor conforms to the qualifications as follows:

The joint filler and slab repair subcontractor has experience in finishing interior floors of similar size and scope in at least 5 previous projects. Projects name and location are identified as follows:

1. _____
2. _____
3. _____
4. _____
5. _____

Concrete Joint Filler and Slab Repair Subcontractor Company Name and Address:

Signature of Responsible Officer: _____

Typed Name and Title of Officer: _____

Telephone Number: (____) _____

General Contractor Company Name and Address:

Signed by: _____ Date: _____

Submit one copy of this Statement to the Architect of Record.

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SECTION 044313 - STONE MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Anchored cut stone veneer at exterior walls.
- B. Metal anchors and accessories for anchored veneer.
- C. Accessories for adhered veneer.
- D. Setting mortar.

1.02 RELATED REQUIREMENTS

- A. Section 040511 - Masonry Mortaring and Grouting: Setting and pointing mortar.
- B. Section 042000 - Unit Masonry: Joint reinforcement, Ties, Anchors, and Through-wall flashing.
- C. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.
- D. Section 076200 - Sheet Metal Flashing and Trim: Flashings.
- E. Section 079200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

- A. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2023.
- B. ASTM C119 - Standard Terminology Relating to Dimension Stone; 2022.
- C. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- D. ASTM C1242 - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems; 2022a.
- E. ASTM C1515 - Standard Guide for Cleaning of Exterior Dimension Stone, Vertical And Horizontal Surfaces, New or Existing; 2020.
- F. ASTM C1528/C1528M - Standard Guide for Selection of Dimension Stone; 2020.
- G. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- I. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on stone units, mortar, and reinforcement.
- C. Samples: Submit two stone samples illustrating minimum and maximum stone sizes, color range, texture, and markings.
- D. Samples: Submit mortar color samples.

1.05 QUALITY ASSURANCE

- A. Stone Fabricator Qualifications: Company specializing in fabricating cut stone with minimum ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type required by this section, with minimum 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect stone from discoloration during storage on site.
- B. Provide ventilation to prevent condensation from forming on stone.

1.07 FIELD CONDITIONS

- A. Cold Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 STONE

- A. Stone, General: See recommendations in ASTM C1528/C1528M.
- B. Stone: to be selected type, to be selected variety.
 - 1. Color: to be selected.
 - 2. Surface Finish: to be selected.

2.02 MORTAR APPLICATIONS

- A. Use only factory premixed packaged dry materials for mortar, with addition of water only at project site.
 - 1. Exception: If a specified mix design is not available in a premixed dry package, provide equivalent mix design using standard non-premixed materials.
- B. Mortar Color: Natural gray unless otherwise indicated.

2.03 MORTAR MIXES

- A. Packaged Dry Material for Mortar for Unit Masonry: Premixed masonry cement and mason's sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Type: N.
 - 2. Color: Standard gray.
 - 3. Manufacturers:
 - a. Amerimix, an Oldcastle brand: www.amerimix.com/#sle.
 - b. The QUIKRETE Companies: www.quikrete.com/#sle.

2.04 ACCESSORIES - ANCHORED VENEER

- A. Horizontal Joint Reinforcement: Truss type; stainless steel wire complying with ASTM A580/A580M Type 304, 3/16 inch diameter side rods with 0.1483 inch diameter cross ties.
 - 1. Manufacturers:
 - a. Blok-Lok Limited; BL-30: www.blok-lok.com/#sle.
 - b. Hohmann & Barnard, Inc; 120 Truss Mesh: www.h-b.com/#sle.
- B. Wall Ties: Formed steel wire, at least 14 gauge diameter, stainless steel complying with ASTM A580/A580M, eye and pintle type, with provision for vertical adjustment after attachment.
- C. Flashings: See Section 042000.
- D. Weep/Cavity Vents: Extruded corrugated polystyrene sheet.
 - 1. Products:
 - a. Masonry Technology, Inc; Stone Cavity Weep: www.mtidry.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- E. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.05 STONE FABRICATION - ANCHORED VENEER

- A. Pattern and Coursing: tbd.
- B. Fabricate for 3/8 inch beds and joints.
- C. Bed and Joint Surfaces:
 - 1. Cut or sawn full square for full thickness of unit.

- D. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that support work and site conditions are ready to receive work of this section.

3.02 PREPARATION - ANCHORED VENEER

- A. Establish lines, levels, and coursing. Protect from disturbance.
- B. Clean stone prior to installation. Do not use wire brushes or implements that mark or damage exposed surfaces.
- C. Clean sawn surfaces of rust stains and iron particles.

3.03 INSTALLATION - ANCHORED VENEER

- A. Size stone units to fit opening dimensions and perimeter conditions.
- B. Arrange stone coursing in running bond with consistent joint width.
- C. Set stone in full mortar setting bed to fully support stone over bearing surface. Use setting buttons or shims to maintain correct joint width.
- D. Install weep/cavity vents in vertical stone joints at a maximum of 32 inches on center horizontally; immediately above horizontal flashings, above shelf angles and supports, and at top of each cavity space; do not permit mortar accumulation in cavity space.

3.04 REINFORCEMENT AND ANCHORAGE - ANCHORED VENEER

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place horizontal joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. In addition, place wall ties at maximum 3 inches on center each way around perimeter of openings, within 12 inches of openings.

3.05 JOINTS - ANCHORED VENEER

- A. Leave the following joints open for sealant; see Section 079200:
 - 1. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
 - 2. Joints in projecting units.
 - 3. Joints between rigidly anchored units, including soffits, panels, and column covers.
 - 4. Joints below lugged sills and stair treads.
 - 5. Joints below ledge and relieving angles.
 - 6. Joints labeled "expansion joint".
- B. Rake out mortar joints 5/8 to 3/4 inch and brush joints clean to accommodate pointing mortar. Fill joints with pointing mortar.
- C. Pack mortar into joints and work into voids. Neatly tool surface to concave joint.
- D. At joints to be sealed, clean mortar out of joint before it sets. Brush joints clean.

3.06 INSTALLATION - MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
- B. Extend metal flashings through exterior face of stone and terminate in an angled drip with hemmed edge.
- C. Extend plastic flashings to within 1/2 inch of exterior face of stone and adhere to top of stainless steel angled drip with hemmed edge.

- D. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.07 CONTROL AND EXPANSION JOINTS

- A. Form joints as detailed on drawings.

3.08 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- C. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.09 CLEANING

- A. Remove excess mortar as work progresses, and upon completion of work.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Clean exterior stone per ASTM C1515.
- E. Use non-metallic tools in cleaning operations.

3.10 PROTECTION

- A. During temporary storage on site, at the end of working day, and during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

END OF SECTION

SECTION 047200 - CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural cast stone.
- B. Units required are:
 - 1. Exterior wall units, including wall caps, coping, and sills.

1.02 RELATED REQUIREMENTS

- A. Section 040511 - Masonry Mortaring and Grouting: Mortar for setting cast stone.
- B. Section 079200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- B. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.
- C. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2019, with Editorial Revision (2020).
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- E. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.
- F. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.
- G. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- H. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).
- I. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2023.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Test results of cast stone components made previously by the manufacturer.
 - 1. Include one copy of ASTM C1364 for Architect's use.
- C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- D. Mortar Color Selection Samples.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Architectural Cast Stone:

2.02 MATERIALS

- A. Portland Cement: ASTM C150/C150M.
 - 1. For Mortar: Type I or II, except Type III may be used in cold weather.
- B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- D. Admixtures: ASTM C494/C494M.
- E. Water: Potable.
- F. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.
 - 1. Galvanized in accordance with ASTM A767/A767M, Class I.
- G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- I. Mortar: Portland cement-lime, as specified in Section 040511 ; do not use masonry cement.
- J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

END OF SECTION

SECTION 047300 - MANUFACTURED STONE MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Evolve Stone
- B. Accessories

1.2 RELATED SECTIONS

- A. Section 054000 - Cold-Formed Metal Framing
- B. Section 061000 - Rough Carpentry
- C. Section 072500 - Weather Barriers
- D. Section 099123 - Interior Painting

1.3 REFERENCES

- A. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of NonMetallic Materials Test Results
- B. D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials Test Results
- C. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference Test Results
- D. ASTM B117 - Standard Practice for Operating Salt Spray
- E. ASTM D2247-15 - Water Resistance Test
- F. AC92 SECTION 4.2 - Freeze-Thaw test
- G. ASTM E84 - Fire Test

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements
- B. Product Data
 - 1. Installation Guides
 - 2. Evolve Stone Style and Color Guide

PART 2 - PRODUCTS

2.1 EVOLVE STONE

- A. Acceptable Manufacturer: Evolve Stone Inc., which is located at: 200 Lenoir Drive Unit B; Winchester, VA 22603; Tel: +1 (800) 614-0373; Tel: +1 (703) 646-8090; Email: info@evolvestone.com; Web: <https://www.evolvestone.com>
- B. Substitutions: Not permitted.
- C. Veneer Stones
 - 1. Description: Evolve Stone siding can be used as an interior wall covering or exterior veneer siding. Each box of veneer stones comes pre-blended with a variety of stone shapes in accordance with the selected style in one color option and in the specified rating. Thicknesses vary from 0.125" to 1.25" with an average thickness of 0.625".

D. Corner Veneer Stones

1. Description: Evolve Stone Corner Stones can be used as an interior wall covering or exterior veneer siding to wrap around the outside of a 90 degree corner. Each box of corner stones comes pre-blended with a variety of stone shapes in accordance with the selected style in one color option and in the specified rating. Thicknesses vary from 0.25" to 1.5" with an average thickness of 0.875".

E. Sill Stones

1. Description: Evolve Stone Sill Stones can be used as an interior wall covering or exterior veneer siding as a linear break under window sills, or as a top border for a watertable. Sill stones are roughly 20" long and are roughly 2.25" tall.

F. Style Offerings

1. Style: National True
2. Style: District View
3. Style: Capital Sky
4. Style: Georgetown Run
5. Style: Monument Gate
6. Style(s) are to be selected and installed per areas defined by Architect from Manufacturer's selection.

G. Color Offerings

1. Color: Phantom Shadow
2. Color: Morning Aspen
3. Color: Dune Point
4. Color: Kodiak Mine
5. Color: Winter Valley
6. Color: River Clay
7. Color: Project Specific Blend
8. Color option(s) are to be selected for each style and install location defined by Architect from Manufacturer's selection. Architects may select multiple color options at each install location to achieve a color blend.

H. Fire Resistance Ratings

1. Rating: Non-Rated
2. Rating: Class B Fire-Rated in accordance with ASTM E84
3. The required fire resistance rating shall be defined at all install locations by Architect in accordance with jurisdictional requirements.
- 4.

2.2MECHANICAL FASTENERS

A. Stainless Steel Finish Nails

1. 16-gauge stainless steel Finish Nails with a fastener length long enough to penetrate through the backside of the sheathing substrate by 1/4 inch, a minimum shank diameter of 0.069 inch, and a minimum head diameter of 0.117 inch. Incorporate 304 stainless steel fasteners in a standard application and 316 stainless steel fasteners in a harsh environment application.

B. Screws

1. Self tapping stainless steel or corrosion resistant trim head screw long enough to firmly grip into blocking where applicable.

C. Rainscreen Fasteners

1. Cap nails, cap staples or cap screws with a length deep enough to penetrate through the rainscreen and into the wooden substrate.

D. WRB Fasteners

1. Use fasteners suggested by the WRB Manufacturer.

2.3 BONDING MATERIALS

A. TREMGrip

1. Description: One component, non-sag, elastic adhesive based on hybrid polymers.

B. Vulkem 171 Primer

1. Description: A quick-drying, one-part, moisture-curing primer that enhances adhesion to concrete, plywood and other porous substrates.

2.4 EXTERIOR SUBSTRATE MATERIALS

A. Wooden Substrate

1. Minimum 1-3/8" thick sheathing of plywood to allow for mechanical fasteners.

B. WRB

1. Water-resistive barrier with ASTM E2556 Type I or Type II.

C. Rainscreen

1. Evolve Rainscreen 1/8" or Keene DRIWALL™ RAINSCREEN 013-1 for US Installations. Use Evolve Rainscreen 3/8" or Keene DRIWALL™ RAINSCREEN 10mm for installations in Canada.

D. Cementitious Substrate

1. A porous surface that is prepped, clean, dry and free of cracks and contaminants to allow for application of bonding materials.

2.5 INTERIOR SUBSTRATE MATERIALS

A. Wooden Substrate

1. Interior applications should include a minimum of 1/4" wood sheathing as part of the wall assembly as specified by Architect to allow for mechanical fasteners.

B. Cementitious Substrate

1. A porous surface that is prepped, clean, dry and free of cracks and contaminants to allow for application of bonding materials.
- C. Paint
1. A dark grey or black paint should be applied to wooden substrates where Evolve Stone will be applied.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly constructed and prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

3.3 FIELD QUALITY CONTROL

- A. Field Inspection:
 1. Coordinate field inspections upon completion of each wall with Architect.
- B. Tolerances
 1. Occasional gaps between stones are allowable up to 0.125"
 2. Occurrences of gaps of 3/16" between stones are allowable at one instance per 5 square feet.
 3. Gaps over 3/16" identified with discretion by Architect are to be corrected by Installer.
 4. Gaps that expose unpainted surfaces are to be corrected by Installer.

3.4 CLEANING AND PROTECTION

- A. Clean products in accordance with the manufacturer's recommendations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

**SECTION 051200 - STRUCTURAL STEEL FRAMING
(PROVIDED BY ACADEMY'S CONTRACTOR)**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.

1.2 DEFINITIONS

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

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer fabricator and testing agency.
- B. Welding certificates.
- C. Mill test reports for structural steel, including chemical and physical properties.
- D. Source quality-control reports.
- E. Field quality-control and special inspection reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated on structural drawings.
 - 2. Use Allowable Stress Design; data are given at service-load level.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 572/A 572M, Grade 50.
- B. Channels, Angles-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade C, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
- F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

- C. Un-headed Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: Straight.
 - 2. Finish: Plain.
- D. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - E. Finish: Plain. Threaded Rods: ASTM A 36/A 36M ASTM A 193/A 193M, Grade B7.
 - 1. Finish: Plain.
- 2.4 PRIMER
 - A. Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - B. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.
 - C. Primer: Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- 2.5 GROUT
 - A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time.
- 2.6 FABRICATION
 - A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- 2.7 SHOP CONNECTIONS
 - A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
 - B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for

tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
 - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5-mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry surfaces and locations of anchor rods, bearing plates, and other embedm compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been correcte

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates Bearing Plates: Clean concrete- and masonry-bearing surfaces of b reducing materials and roughen surfaces prior to setting plates. Clean bottom s plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumb. Do not remove wedges or shims but, if protruding, cut off flange edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Follow with manufacturer's written installation instructions for shrinkage-resistant grout.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.4 FIELD QUALITY CONTROL

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

according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

- a. Liquid Penetrant Inspection: ASTM E 165.
- b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
- c. Ultrasonic Inspection: ASTM E 164.
- d. Radiographic Inspection: ASTM E 94.

END OF SECTION 051200

**SECTION 052100 - STEEL JOIST FRAMING
(PROVIDED BY ACADEMY'S CONTRACTOR)**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. K-series steel joist substitutes.
3. Joist girders.
4. Joist accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Manufacturer certificates.

C. Mill Certificates: For each type of bolt.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

PART 2 - PRODUCTS

2.1 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

2.2 JOIST GIRDERS

- A. Manufacture joist girders according to "Standard Specifications for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.

2.3 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.
- C. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1. Finish: Plain.
- D. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.4 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.
- B. Apply one coat of shop primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

END OF SECTION 052100

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SECTION 053100 - STEEL DECKING
(PROVIDED BY ACADEMY'S CONTRACTOR)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product certificates.

C. Evaluation reports.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.3 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. New Millennium.
2. Vulcraft

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Refer to structural drawings for deck type and gauge.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 12 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 50,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

G. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not

stretch or contract side-lap interlocks.

- C. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- D. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- E. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- F. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- G. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.
- H. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.3 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation and apply repair paint.

END OF SECTION 053100

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SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Product test reports.

1.4 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency.

B. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One- and Two-Family Dwellings."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. ClarkDietrich Building Systems.

2. Steel Network, Inc. (The).

2.2 PERFORMANCE REQUIREMENTS

- A. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: ST33H and as indicated in drawings.
 2. Coating: G60, A60, AZ50, or GF30.
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: 33 and as indicated in drawings.
 2. Coating: G60.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 16-gauge unless noted otherwise in drawings.
 2. Flange Width: 1-3/8-inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according

to ASTM A 123/A 123M.

- B. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC- ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths.
- E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8-inch in 10-feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8-inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.2 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks, and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to infill studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18- inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - a. Install solid blocking at 96-inch centers.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.3 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

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SECTION 055000 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.
- B. Downspout boots.
- C. Hidden access panels.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 055213 - Pipe and Tube Railings.
- C. Section 077123 - Manufactured Gutters and Downspouts: Downspout boots.
- D. Section 099113 - Exterior Painting: Paint finish.
- E. Section 099123 - Interior Painting: Paint finish.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200 - Unit Prices, for additional requirements.
- B. Components:
 - 1. Basis of Measurement: By the unit.
 - 2. Basis of Payment: Includes fabrication, finishing, and installation.

1.04 REFERENCE STANDARDS

- A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.

1.06 QUALITY ASSURANCE

- A. Design bollards under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- B. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

2.03 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

2.05 DOWNSPOUT BOOTS

- A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
 1. Configuration: Angular.
 2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
 3. Finish: Manufacturer's standard factory applied powder coat finish.
 4. Color: To be selected by Architect from manufacturer's standard range.
 5. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.

2.06 FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: high performance organic coating.
- B. Interior Aluminum Surfaces: Class I natural anodized.
- C. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- D. High Performance Organic Coating System: AAMA 2604 multiple coat, thermally cured fluoropolymer system; color as indicated.
- E. High Performance Organic Coating System: Multi-coat, high-durable polyester system; color as selected from manufacturer's standard colors.
 1. Systems:
 - a. Two-coat in accordance with AAMA 2604.
 2. Manufacturers:
 - a. Beckers Group; Beckry Tech: www.beckers-group.com/#sle.

- b. Substitutions: See Section 016000 - Product Requirements.

2.07 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 055133 - METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop-fabricated metal ladders.
- B. Cantilever Platform
- C. Security Gate
- D. Prefabricated ladders.

1.02 RELATED REQUIREMENTS

- A. Section 099113 - Exterior Painting: Paint finish.
- B. Section 118129 - Facility Fall Protection: Ladder safety systems.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).
- E. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- F. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1.05 QUALITY ASSURANCE

- A. Design _____ under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.
- B. Bolts, Nuts, and Washers: Stainless steel.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.

- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 PREFABRICATED LADDERS

- A. Prefabricated 1,500 lb load capacity Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
 - 1. Components: Manufacturer's standard rails, rungs, treads, handrails, returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section. Components may include some or all of the following:
 - a. Ladder Stringer:
 - 1) 3-inches by 1-inch by 1/8-inch (64-mm by 27-mm by 3-mm) extruded 6005-T5 aluminum tubing. Pitch: 90 degrees.
 - b. Ladder Tread:
 - 1) 2-1/4-inches by 3/4-inch by 1/4-inch (57-mm by 19-mm by 6-mm) extruded 6005-T5 aluminum with deeply serrated top surface.
 - c. Ladder Wall Mounting Bracket:
 - 1) 20-inches minimum (field verify depth required to meet OSHA regulations at all projections where ladder will be mounted) by 2-inches by 3-inches by 1/4-inches thick (508-mm by 51-mm by 76-mm by 6-mm) aluminum angle.
 - d. Floor Brackets:
 - 1) Floor bracket at foot of each stringer. 3-inches by 2-inches by 1/4-inch (76-mm by 51-mm by 6-mm).
 - e. Cantilever Platform:
 - 1) Bar grating.
 - 2) Platform size 24-inches to 30-inches by width as required by OSHA (610-mm to 762-mm by 1219-mm) standard.
 - 3) Toe Boards: 6005 T-5 aluminum.
 - f. Handrails:
 - 1) 3-inches by 1-inch by 1/8-inches (76-mm by 25-mm by 3-mm), 6005-T5 aluminum tubular siderail, 42-inches (1067 mm) high; reference drawings.
 - g. Safety Cage:
 - 1) Vertical and horizontal bars: 1/4-inch by 2-inches (6-mm by 51-mm) 6005-T5 aluminum flat bar.
 - h. Security Gate:
 - 1) Hinged gate at bottom of cage with padlock provision.
 - i. Finishes:
 - 1) Powder coated on all aluminum ladder components. Refer to drawings for color.
 - 2. Materials:
 - a. Aluminum; 6063 alloy, T52 temper.
 - 3. Finish:
 - a. Powder coat; color to be selected by Architect from manufacturer's standard range.
 - 4. Manufacturers:
 - a. O'Keeffe's Inc;
 - 1) Model 503A plus all required accessories based on site requirements: www.okeeffes.com/#sle.
 - b. Precision Ladders, LLC; Model FLH-06 - Basis of Design,
 - 1) www.precisionladders.com/#sle.
 - c. Substitutions:
 - 1) See Section 016000 - Product Requirements.

2.04 FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: Class I natural anodized.
- B. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

**SECTION 055213
PIPE AND TUBE RAILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Stair railings and guardrails.
- C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 042000 - Unit Masonry: Placement of anchors in masonry.
- C. Section 055100 - Metal Stairs: Handrails other than those specified in this section.
- D. Section 055100 - Metal Stairs: Attachment plates for handrails specified in this section.
- E. Section 092116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.
- F. Section 099113 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- G. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- H. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- I. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2024.
- J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- M. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Samples: Submit two, 3 inch long samples of handrail. Submit two samples of elbow, wall bracket, and end stop.
- D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.
- E. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Comply with ASTM E985.
- C. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- E. Allow for expansion and contraction of members and building movement without damage to connections or members.
- F. Dimensions: See drawings for configurations and heights.
 - 1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
 - 2. Intermediate Rails: 1-1/2 inches diameter, round.
 - 3. Posts: 1-1/2 inches diameter, round.
- G. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
 - 1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
 - 2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
 - 3. For anchorage to stud walls, provide backing plates, for bolting anchors.
 - 4. Posts: Provide adjustable flanged brackets.
- H. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.

- C. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- E. Exposed Fasteners: No exposed bolts or screws.
- F. Galvanizing: In accordance with requirements of ASTM A123/A123M.
 - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Weld connections that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding and bolting.
 - 3. Clean welds, bolted connections, and abraded areas.
 - 4. Touch up shop primer and factory-applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.
- F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sheathing.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Miscellaneous framing and sheathing.
- E. Communications and electrical room mounting boards.
- F. Concealed wood blocking, nailers, and supports.
- G. Wall sheathing with factory applied water-resistive and air barrier sheet.

1.02 RELATED REQUIREMENTS

- A. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.
- B. Section 076200 - Sheet Metal Flashing and Trim: Sill flashings.
- C. Section 092116 - Gypsum Board Assemblies: Gypsum-based sheathing.
- D. Section 313116 - Termite Control: Field-applied termiticide and mildewcide for wood materials.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.
- F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2024.
- G. PS 2 - Performance Standard for Wood Structural Panels; 2018.
- H. PS 20 - American Softwood Lumber Standard; 2025.
- I. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- K. WWPA G-5 - Western Lumber Grading Rules; 2025.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

- E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
 - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for materials and workmanship commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.

2.03 CONSTRUCTION PANELS

- A. Wall Sheathing: PS 2 type.
 - 1. Bond Classification: Exterior.
 - 2. Grade: Structural I Sheathing.
 - 3. Span Rating: 24.
 - 4. Performance Category: 5/16 PERF CAT.
 - 5. Edge Profile: Square edge.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Gypsum Board Screws: ASTM C1002; Type W, bugle head, self-piercing, tapping screws; length to penetrate wood members 5/8 inch minimum.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWP A U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
- B. Fire Retardant Treatment: (all plywood to be fire treated).
 - 1. Exterior Type: AWP A U1, Category UC F B, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat exterior rough carpentry items.
 - c. Do not use treated wood in direct contact with the ground.
 - 2. Interior Type A: AWP A U1, Use Category UC F A, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Interior rough carpentry items are to be fire retardant treated.
 - c. Treat rough carpentry items as indicated .
 - d. Do not use treated wood in applications exposed to weather or where the wood may become wet.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual, and _____.
- E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide the following specific nonstructural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.

3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

3.06 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Coordination of ABAA Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA QAP.
 - 2. Notify in ABAA writing of schedule for air barrier work. Allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.

3.08 CLEANING

- A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior trim.
2. Interior plywood paneling.
3. Shelving.
4. Arbor Barnwood (Remodel stores as needed only).

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20.

1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - a. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

B. Softwood Plywood: DOC PS 1.

C. Hardboard: AHA A135.4.

D. MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.

E. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.

F. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: White.

2.2 INTERIOR TRIM

A. Quality Grade: Unless otherwise indicated, provide products of quality specified in AWI/AWMAC/WI Architectural Woodwork Standards for Premium Grade.

B. Softwood Lumber Trim:

1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NeLMA, NLGA, or WWPA.
2. Species: Douglas fir-larch or Douglas fir south; NLGA, WCLIB, or WWPA.
3. Species: Southern pine; SPIB.
4. Species: Western red cedar; NLGA, WCLIB, or WWPA.

C. Hardwood Lumber Trim:

1. Species: Aspen, basswood, cottonwood, sap gum, sycamore, white maple, or yellow poplar.

D. Softwood Moldings for Transparent Finish (Stain or Clear Finish):

1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine Southern pine.

E. Hardwood Moldings for Transparent Finish (Stain or Clear Finish): WMMPA HWM 2, N-grade wood moldings made to patterns included in WMMPA HWM 1.

1. Species: Aspen, basswood, cottonwood, sap gum, sycamore, white maple, or yellow poplar.

F. Moldings for Opaque Finish (Painted Finish):

1. Softwood Moldings: WMMPA WM 4, P grade.
 - a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
2. Hardwood Moldings: WMMPA HWM 2, P-grade.
 - a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
3. Optional Material: Primed MDF.

2.3 SHELVING

A. Shelving: Made from one of the following materials, 3/4-inch thick.

1. Particleboard with radiused and filled or solid-wood front edge.
2. MDF with radiused or solid-wood front edge.
3. MDO softwood plywood with solid-wood edge.
4. Melamine-faced particleboard with applied-PVC front edge.

B. Shelf Cleats: 3/4-inch by-3-1/2-inch boards, as specified above for shelving.

2.4 ARBOR BARNWOOD

- A. Provided by Academy.
- B. Framing: S4S with surface sapstain control and end sealed treated dimensional lumber.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Roseburg – A Forest Products Company; PO Box 1088, Roseburg, OR 97470.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

- A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to a tolerance of 1/8-inch in 96-inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.3 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

3.4 SHELVING INSTALLATION

- A. Cut shelf cleats at ends of shelves about 1/2-inch less than width of shelves and sand exposed ends smooth.
- B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face, and filled. Space fasteners not more than 16-inches O.C.
- C. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.

END OF SECTION 062023

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SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

1.2 ACTION SUBMITTALS

- A. Product Data:** For each type of product, including panel products high-pressure decorative laminate and cabinet hardware and accessories.
- B. Shop Drawings:** Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:**
1. Plastic laminates, for each color, pattern, and surface finish.
 2. Thermoset decorative panels, for each color, pattern, and surface finish.

1.3 FIELD CONDITIONS

- A. Environmental Limitations:** Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard:** Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
- B. Grade:** Custom.
- C. Type of Construction:** Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style:** Flush overlay.
- E. Reveal Dimension:** 1/4-inch.

- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Wilsonart International Holdings, Inc.
 - b. Panolam Surface Systems (Pionite HPL)
- G. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- H. Materials for Semi-exposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by laminate manufacturer's designations as keyed on drawings.
 - a. PL-8: Pionite #SG228 "Slate Suede" – vertical exterior millwork surfaces (acceptable alternate: Wilsonart #D91-60 "Slate Grey").
 - b. PL-10: Wilsonart #1573-60 "Frosty White" – millwork interior surfaces

2.2 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, finishes, installation, and other requirements.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Panolam Surface Systems (Pionite HPL)
- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated by manufacturer's designations as noted on drawings.
 - a. PL-9: Pionite - #WO680-SD "Crackle Crunch" – horizontal surfaces and edge banding.

E. Core Material at Sinks: Particleboard made with exterior glue.

F. Core Thickness: 3/4-inch.

1. Build up countertop thickness to 1-1/2-inches at front, back and ends with additional layers of core material laminated to top.

G. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD3, Grade BKL, on underside of countertop substrate.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
3. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."

B. Cabinet Hinges: 1-1/2 pairs for doors, US26 finish, #331 or #332 manufactured by Stanley

C. Wire Pulls: Back mounted, solid metal, 4-inches long, 5/16-inch in diameter.

1. Finish: US26
2. Manufacturer: Stanley #4484

D. Catches: Magnetic catches, BHMA A156.9, B03141.

1. Manufacturer: Stanley BB8173.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

1. Manufacturer: Knappe & Vogt; 255 or 80.

F. Shelf Rests: BHMA A156.9, B04013; metal.

1. Manufacturer: Knappe & Vogt; 256 or 180.

G. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted; partial-extension type; zinc-plated steel with polymer rollers.

H. Door and Drawer Silencers: BHMA A156.16, L03011.

I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesive for Bonding Plastic Laminate: Contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8-inch in 96-inches.
- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16-inches O.C., with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

END OF SECTION 064116

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SECTION 064216 - WOOD PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood paneling (wood-veneer wall surfacing).
2. Wood furring, blocking, shims, and hanging strips for installing wood paneling unless concealed within other construction before paneling installation.
3. Finishing of wood paneling.

1.2 ACTION SUBMITTALS

- A. Product Data:** For each type of product including Maple Beadboard, adhesives, and processes.
- B. Shop Drawings:** Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
1. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.
 2. For paneling veneered in fabrication shop, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

1.3 INFORMATIONAL SUBMITTALS

- A. Woodwork Quality Standard Compliance Certificates:** AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications:** Certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications:** Certified participant in AWI's Quality Certification Program.

1.5 FIELD CONDITIONS

- A. Environmental Limitations:** Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PANELING FABRICATORS

- A. BlueLinx, a Distribution Division of Georgia Pacific Corporation, Corporate Office Location - Marietta Georgia.

- 1. Basis of Design Product: BlueLinx MAP1448FRDBU21 – 4-feet X 8-feet X 1/4-inch Maple Bead Board – Beads at 1-inch O.C.

- B. No Substitutions

2.2 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of wood paneling (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.

- 1. Provide labels from HPVA HP-1, from most recent version, certification program indicating that paneling complies with requirements of grades specified.

2.3 WOOD PANELING (WOOD-VENEER WALL SURFACING) **(WP-1)**

- A. Grade: B Grade.
- B. Wood Species and Cut: Maple, rotary spliced.
- C. Bead Patterns: 1-inch O.C., vertical orientation for installation.
- D. Matching of Adjacent Veneer Leaves: Pleasing match.
- E. Matching within Panel Face: Running match.
- F. Matching of Adjacent Veneer Leaves and within Panel Face: Book match.
- G. Panel-Matching Method: No grain matching is required between panels. Select and arrange panels for similarity of grain pattern and color between adjacent panels. Vertical joints between panels to continue spacing pattern set by bead pattern spacing. Trim panels at outside edge of trim wood, framework areas that wood panels are installed in. All horizontal abutment joints to have a premanufactured panel edges.
- H. Panel Core Construction: medium-density fiberboard.
- I. Thickness: 1/4-inch (6.35-mm)
- J. Back Grade: 3 Back
- K. Exposed Panel Edges: Inset wood-veneer matching faces
- L. Horizontal Panel Reveals: Stainless-steel channels, 1-inch by 1-inch by 1/16-inch (25.4 by 25.4 by 1.6-mm) thick.
- M. Assemble panels by gluing and concealed fasteners..

2.4 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- B. Wood Moisture Content: 8 to 13 percent.
- C. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2.
 - 2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.5 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
 - 1. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5-feet (3.2-m) beyond the centerline of the burners at any time during the test.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
 - 1. For panels 3/4-inch (19=mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2070 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 and 225 lbf (1100 and 1000 N), respectively.
- D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.6 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.
- C. Installation Adhesive: Product recommended by AWI and panel fabricator for each substrate for secure anchorage.

2.7 FINISHING

- A. General: Finish paneling at site as specified in this Section. Final touchup sanding, cleaning, and polishing after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
 - 1. Back-priming: Apply two coats of sealer compatible with finish coats, to concealed surfaces of paneling.
- C. Transparent Finish:
 - 1. Grade: Same as item to be finished.
 - 2. Finish: System - water-based polyacrylic.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before sealing and finishing.
 - 4. Staining: None required
 - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with same grade as paneling to be installed.
- B. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8-inch in 96-inches (3-mm in 2400-mm). Install with no more than 1/16-inch in 96-inch (1.6-mm in 2400-mm) vertical

cup or bow and 1/8-inch in 96-inch (3-mm in 2400-mm) horizontal variation from a true plane.

1. For paneling with horizontal revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32-inch (0.8-mm).
- C. Anchor paneling to supporting substrate with blind nailing. Do not use face fastening unless otherwise indicated.

END OF SECTION 064216

SECTION 066400 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes plastic sheet paneling.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For plastic paneling and trim accessories.

PART 2 - PRODUCTS

2.1 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling (FRP1): Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Composites, Inc.: Kemlite Fire-X 'Glasboard' Embossed FRP Wall Panels or 'Sequentia' Embossed FRP Wall Panels.
- 2. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings from an applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
- 3. Nominal Thickness: Not less than 0.09-inch (2.3-mm).
- 4. Surface Finish: Molded pebble texture.
- 5. Color: White #85 (Glasboard) or #1130 (Sequentia) or as indicated on the Drawings.

- B. Vinyl/Acrylic Panels (Acrovyn):

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Impact Specialties –Acrovyn 4000 Wall Covering.
 - 1) To order material and installation instructions, email: orders@impactspecialties.com or hschaefer@impactspecialties.com or call 888-424-6287 or fax 908-849-4295.

2. Surface Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
3. Nominal Thickness: Not less than .040-inch-thick panel.
4. Surface Finish: 040 Suede texture.
5. Color: As indicated on finish schedule. Academy's standard color #136 Pearl Gray.

2.2 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
 1. Color: Match panels.
- B. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."
 1. Color: Clear

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- B. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- C. Lay out paneling before installing. Locate panel joints so that trimmed panels at corners are not less than 12-inches (300-mm) wide.

3.2 INSTALLATION (FRP)

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install trim accessories with adhesive.
- D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

- F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

3.3 INSTALLATION (ACROVYN)

- A. Install paneling according to manufacturer's written instructions. Detailed instruction documents must be requested electronically from Customer Care Rep when placing an order, or they can be downloaded at <https://impactspecialties.com/technical-documents>.
- B. Wall Priming:
 - 1. New Drywall or Plaster – Walls must be sealed/primed using a water-based mastic primer.
 - 2. Painted Drywall or Plaster – Painted walls must be checked for adhesion as described in manufacturer's installation instructions – preparation section. If the paint will not provide an acceptable base for adhesion, all areas must be removed of paint and primed with a water-based mastic primer.
- C. Install panels in a full spread of manufacturer recommended adhesive. Butt end to end, no vertical joint seam transitions for a seamless panel appearance.
- D. Abutting Sheets:
 - 1. Butt Joints – Butt joints should be used in temperature-controlled environments of 75° + 5° F during and after the installation. If the temperature is expected to exceed these temperatures, please refer to the Thermal Movement Chart on the cover of the Manufacturer's Installation Instructions to determine the appropriate spacing.
 - 2. Color Matched Caulk – Construction Specialties Inc – purchase separately for use at joints between sheets. Refer to the Thermal Movement Chart for appropriate gap width. Do not make gap less than 1/16-inch wide.
- E. Install trim accessories with manufacturer recommended adhesive.
- F. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- G. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then whip clean with dry cloths until no residue remains.
- H. Room temperature must be maintained between 60°F and 80°F after installation.

END OF SECTION 066400

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SECTION 072100 - THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Batt insulation and vapor retarder in exterior wall construction.
- B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.
- B. Section 072700 - Air Barriers: Separate air barrier materials.

1.03 DEFINITIONS

- A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.
 - 1. Based on type of insulation substance, the material will be referred to as a mineral fiber when having a rock or slag base, and glass fiber with a glass or silica sand base, also considered a mineral.
 - 2. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.
 - 3. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

1.04 REFERENCE STANDARDS

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- D. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2017.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- E. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

1.06 QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
 - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.07 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 - 1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4. Formaldehyde Content: Zero.
 - 5. Thermal Resistance: R-value of 20.
 - 6. Thickness: 5-1/2 inch.
 - 7. Facing: Aluminum foil, flame spread 25 rated; one side.
 - 8. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
- B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Provide foil facing on one side, at locations indicated on drawings.
 - 4. Products:
 - a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
 - b. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
 - c. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.

2.03 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Retain insulation batts in place with spindle fasteners at 12 inches on center.
- F. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member
- G. Tape seal tears or cuts in vapor retarder.
- H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
 - 2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.

3.04 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 072119 - FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Foamed-in-place insulation.
 - 1. In exterior framed walls.
 - 2. In exterior wall crevices.
- B. Foamed-in-place intumescent insulation, single-layer monolithic system.
- C. Foamed-in-place intumescent insulation, two-layer hybrid system.

1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- B. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).
- C. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2020.
- D. ASTM D1623 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics; 2017 (Reapproved 2023).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- G. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- H. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials; 2022.
- I. NFPA 275 - Standard Method of Fire Tests for the Evaluation of Thermal Barriers; 2022.
- J. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.
- K. UL 1040 - Standard for Safety Fire Test of Insulated Wall Construction; Current Edition, Including All Revisions.
- L. UL 1715 - Standard for Safety Fire Test of Interior Finish Material; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.
- C. Certificates: Certify that products of this section meet or exceed specified requirements.
- D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection as required by ABAA QAP.
- E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience, and approved by manufacturer.
- C. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
 - 1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
 - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.05 FIELD CONDITIONS

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.
- B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Foamed-In-Place Insulation:
 - 1. BASF Corporation; WALLTITE US Series Closed Cell: www.spf.basf.com/#sle.
 - 2. Carlisle Spray Foam Insulation: www.carlisesfi.com/#sle.
 - 3. Johns Manville: www.jm.com/#sle.
- B. Foamed-In-Place Intumescent Insulation:
 - 1. Preferred Solutions, Inc: www.preferredsolutions.net/#sle.
 - 2. Preferred Solutions, Inc: www.preferredsolutions.net/#sle.

2.02 MATERIALS

- A. Foamed-In-Place Intumescent Insulation (Single-Layer Monolithic System): Medium-density, rigid, two-part, closed cell polyurethane foam; foamed on-site using blowing agent of non-ozone-depleting gas.
 - 1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.
 - a. Fire Protection: Provide 15-minute thermal barrier of 1/2 inch gypsum board or equivalent material complying with NFPA 275 test method, or foamed-in-place insulation either exposed or with covering that complies with FM 4880, NFPA 286, UL 1040, or UL 1715.
 - 2. Thermal Resistance: R-value of 5.7, minimum, per 1 inch thickness at 140 degrees F mean temperature, at 90 days, when tested in accordance with ASTM C518.
 - 3. Water Vapor Permeance: 0.99 perms, maximum, when tested at 3.5 inch thickness in accordance with ASTM E96/E96M.
 - 4. Air Permeance: 0.002 cfm per sq ft, maximum, when tested at 1 inch thickness in accordance with ASTM E2178 at 1.57 psf.
 - 5. Closed Cell Content: At least 90 percent.
 - 6. Density: 2.0 lbs/cu ft, nominal, in accordance with ASTM D1622.
 - 7. Tensile Strength: 55 psi, minimum, in accordance with ASTM D1623.
 - 8. Compressive Strength: 22 psi, minimum, in accordance with ASTM D1621.
 - 9. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, at 4 inch thick when tested in accordance with ASTM E84.
- B. Foamed-In-Place Intumescent Insulation (Two-Layer Hybrid System): Foamed on-site using blowing agent of non-ozone-depleting gas.

1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.
 - a. Fire Protection: Provide 15-minute thermal barrier of 1/2 inch gypsum board or equivalent material complying with NFPA 275 test method, or foamed-in-place insulation either exposed or with covering that complies with FM 4880, NFPA 286, UL 1040, or UL 1715.
2. Base Layer: Medium-density, semi-rigid, closed cell, spray polyurethane foam.
 - a. Thermal Resistance: R-value of 7.0, minimum, per 1 inch thickness at 140 degrees F mean temperature, at 90 days, when tested in accordance with ASTM C518.
 - b. Water Vapor Permeance: 0.95 perms, maximum, when tested at 1 inch thickness in accordance with ASTM E96/E96M.
 - c. Closed Cell Content: At least 98 percent.
 - d. Density: 2.0 lbs/cu ft, nominal, in accordance with ASTM D1622.
 - e. Tensile Strength: 62 psi, minimum, in accordance with ASTM D1623.
 - f. Compressive Strength: 21 psi, minimum, in accordance with ASTM D1621.
 - g. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, at 4 inch thick when tested in accordance with ASTM E84.
3. Top Layer (Exposed Surface Layer): Medium-density, semi-rigid, two-part, closed cell, intumescent, spray polyurethane foam.
 - a. Thermal Resistance: R-value of 5.7, minimum, per 1 inch thickness at 140 degrees F mean temperature, at 90 days, when tested in accordance with ASTM C518.
 - b. Water Vapor Permeance: 0.99 perms, maximum, when tested at 3.5 inch thickness in accordance with ASTM E96/E96M.
 - c. Air Permeance: Less than 0.002 cfm per sq ft, when tested at 1 inch thickness in accordance with ASTM E2178 at 1.57 psf.
 - d. Closed Cell Content: At least 90 percent.
 - e. Density: 2.0 lbs/cu ft, nominal, in accordance with ASTM D1622.
 - f. Tensile Strength: 55 psi, minimum, in accordance with ASTM D1623.
 - g. Compressive Strength: 22 psi, minimum, in accordance with ASTM D1621.
 - h. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, at 4 inch thick when tested in accordance with ASTM E84.

2.03 ACCESSORIES

- A. Primer: As required by insulation manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete before insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.02 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Do not apply cellulose fiber insulation in areas where temperatures exceed 150 degrees F.
- D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Field inspections and tests will be performed by an independent testing agency.
- C. Coordination of ABAA Tests and Inspections:
 - 1. Provide testing and inspection required by ABAA QAP.
 - 2. Notify in ABAA writing of schedule for air barrier work. Allow adequate time for testing and inspection.
 - 3. Cooperate with ABAA testing agency.
 - 4. Allow access to air barrier work areas and staging.
 - 5. Do not cover air barrier work until tested, inspected, and accepted.

3.05 PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 072400 - EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Composite wall and soffit cladding of rigid insulation and reinforced finish coating, Class PB.

1.02 RELATED REQUIREMENTS

- A. Section 054000 - Cold-Formed Metal Framing: Sheathing on metal studs.
- B. Section 072500 - Weather Barriers.
- C. Section 076200 - Sheet Metal Flashing and Trim: Perimeter flashings.
- D. Section 079200 - Joint Sealants: Sealing joints between EIFS and adjacent construction and penetrations through EIFS.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.
- C. ASTM C297/C297M - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions; 2016.
- D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- E. ASTM C847 - Standard Specification for Metal Lath; 2018.
- F. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2023.
- G. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage; 2013 (Reapproved 2019).
- H. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 2022.
- I. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity; 2015 (Reapproved 2020).
- J. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- M. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies; 2018.
- N. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).
- O. ASTM G155 - Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials; 2021.
- P. ICC-ES AC219 - Acceptance Criteria for Exterior Insulation and Finish Systems; 2009, with Editorial Revision (2022).
- Q. ICC-ES AC235 - Acceptance Criteria for EIFS Clad Drainage Wall Assemblies; 2015, with Editorial Revision (2022).
- R. NFPA 259 - Standard Test Method for Potential Heat of Building Materials; 2023, with Errata.

- S. NFPA 268 - Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source; 2022.
- T. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.
- C. Shop Drawings: Indicate wall and soffit joint patterns, joint details, and molding profiles.
- D. Selection Samples: Submit manufacturer's standard range of samples illustrating available coating colors and textures.
- E. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

1.05 QUALITY ASSURANCE

- A. Maintain copy of specified installation standard and manufacturer's installation instructions at project site during installation.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.
- B. Storage: Store materials as directed by manufacturer's written instructions.

1.07 FIELD CONDITIONS

- A. Do not prepare materials or apply EIFS under conditions other than those described in the manufacturer's written instructions.
- B. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.
- C. Do not install coatings or sealants when ambient temperature is below 40 degrees F.
- D. Do not leave installed insulation board exposed to sunlight for extended periods of time.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's standard material warranty, covering a period of not less than 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Dryvit Systems, Inc; Dryvit Outsulation Plus MD EIFS, Class PB with Moisture Drainage: www.dryvit.com/#sle.
- B. Other Acceptable Exterior Insulation and Finish Systems Manufacturers:

2.02 EXTERIOR INSULATION AND FINISH SYSTEM

- A. Exterior Insulation and Finish System: DRAINAGE type; reinforced finish coating on mechanically-fastened insulation board over sheet-type combination drainage layer/water-resistive barrier over substrate; provide a complete system that has been tested to show compliance with the following characteristics; include all components of specified system and substrate(s) in tested samples.
- B. Fire Characteristics:
 - 1. Flammability: Pass, when tested in accordance with NFPA 285.
 - 2. Ignitability: No sustained flaming when tested in accordance with NFPA 268.

3. Potential Heat of Foam Plastic Insulation Tested Independently of Assembly: No portion of the assembly having potential heat that exceeds that of the insulation sample tested for flammability (above), when tested in accordance with NFPA 259 with results expressed in Btu per square foot.
- C. Adhesion of Water-Resistive Coating to Substrate: For each combination of coating and substrate, minimum flatwise tensile bond strength of 15 psi, when tested in accordance with ASTM C297/C297M.
 - D. Adhesion to Water-Resistive Coating: For each combination of insulation board and substrate, when tested in accordance with ASTM C297/C297M, maximum adhesive failure of 25 percent unless flatwise tensile bond strength exceeds 15 psi in all samples.
 - E. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.
 - F. Drainage Efficiency: Average minimum efficiency of 90 percent, when tested in accordance with ASTM E2273 for 75 minutes.
 - G. Salt Spray Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 300 hours exposure in accordance with ASTM B117, using at least three samples matching intended assembly, at least 4 by 6 inches in size.
 - H. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ICC-ES AC219 or ICC-ES AC235.
 - I. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycles 1, 5, or 9.
 - J. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.
 - K. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.
 - L. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 113.5 gallons of sand.

2.03 MATERIALS

- A. Finish Coating Top Coat: Water-based, air curing, acrylic or polymer-based finish with integral color and texture.
 1. Texture: DRYVIT – Sandblast.
 2. Color: As indicated on drawings.
- B. Base Coat: Fiber-reinforced, acrylic or polymer-based product compatible with insulation board and reinforcing mesh, Class PB.
- C. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.
- D. Graphite Polystyrene (GPS) Board Insulation: Complies with ASTM C578, Type VIII.
 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 3. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.

4. Board Edges: Square.
5. Water Absorption: 1 percent by volume, maximum.
6. Compressive Resistance: 14 psi.
7. Thermal Resistance: R-value of 5 per 1 inch at 75 degrees F mean temperature.

E. Water-Resistive Barrier: See Section 072500.

2.04 ACCESSORIES

- A. Insulation Adhesive: Type required by EIFS manufacturer for project substrate.
- B. Insulation Fasteners: Fastener and plate system appropriate for substrate and as recommended by EIFS manufacturer.
- C. Metal Flashings: See Section 076200.
- D. Metal Lath: ASTM C847, self-furring galvanized diamond mesh, 2.5 lb/sq yd.
- E. Trim: EIFS manufacturer's standard PVC or galvanized steel trim accessories, as required for a complete project and including starter track and drainage accessories.
- F. Sealant Materials: Compatible with EIFS materials and as recommended by EIFS manufacturer.
- G. Exterior Soffit Vents: One piece, perforated, ASTM A653/A653M galvanized steel with G90 coating, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is sound and free of oil, dirt, other surface contaminants, efflorescence, loose materials, or protrusions that could interfere with EIFS installation and is of a type and construction that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.
- B. Verify that substrate surface is flat, with no deviation greater than 1/4 in when tested with a 10 ft straightedge.

3.02 PREPARATION

- A. Install self-furring metal lath over solid substrates that are deemed unacceptable to receive adhesively applied insulation. Install in accordance with ASTM C1063, except for butt-lapping instead of overlapping.
 1. Attach to concrete and concrete masonry using corrosion-resistant power or powder actuated fasteners or hardened concrete stub nails not less than 3/4 inch long and with heads not less than 3/8 inch wide. Ensure that fasteners are securely attached to substrate and spaced at maximum 16 inches on center horizontally and 7 inches vertically.

3.03 INSTALLATION - GENERAL

- A. Install in accordance with EIFS manufacturer's instructions and ASTM C1397.
 1. Where different requirements appear in either document, comply with the most stringent.
 2. Neither of these documents supercedes provisions of Contract Documents that defines contractual relationships between parties or scope of this work.

3.04 INSTALLATION - INSULATION

- A. Install in accordance with manufacturer's instructions.
- B. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.
- C. On wall surfaces, install boards horizontally.

- D. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous flush insulation surface, with no gaps in excess of 1/16 inch.
- E. Fill gaps greater than 1/16 inch with strips or shims cut from the same insulation material.
- F. Rasp irregularities off surface of installed insulation board.
- G. Mechanical Fastening: Space fasteners as recommended by EIFS manufacturer.

3.05 INSTALLATION - CLASS PB FINISH

- A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at terminations of EIFS. Install reinforcing fabric as recommended by EIFS manufacturer.
 - 1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches.
 - 2. Allow base coat to dry a minimum of 24 hours before next coating application.
- B. Apply finish coat after base coat has dried not less than 24 hours, embed finish aggregate, and finish to a uniform texture and color.
- C. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.

3.06 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean EIFS surfaces and work areas of foreign materials resulting from EIFS operations.

3.07 PROTECTION

- A. Protect completed work from damage and soiling by subsequent work.

END OF SECTION

SECTION 072500 - WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water-resistive barriers.

1.02 RELATED REQUIREMENTS

- A. Section 072100 - Thermal Insulation: Weather barrier installed in conjunction with batt insulation.
- B. Section 076200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

1.03 DEFINITIONS

- A. Weather Barriers: Materials or assemblies forming water-resistive barriers, air barriers, vapor retarders, or combination of one or more assemblies.
- B. Water-Resistive Barriers: Materials or assemblies installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly.

1.04 REFERENCE STANDARDS

- A. AATCC Test Method 127 - Test Method for Water Resistance: Hydrostatic Pressure; 2018, with Editorial Revision (2019).
- B. ASTM D779 - Standard Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method; 2016.
- C. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2024.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- G. ASTM E2556/E2556M - Standard Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment; 2010 (Reapproved 2016).
- H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. ICC-ES AC308 - Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2021).
- J. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017, with Editorial Revision (2021).
- K. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics.

1.06 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIERS

- A. Description: Materials installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly. Primary materials include mechanically applied sheets; accessory materials include flashings and seam tapes.
- B. Regulatory Requirements: For use in ICC (IBC) construction Types I, II, III, and IV buildings greater than 40 feet in height.
 - 1. Comply with NFPA 285 wall assembly requirements in accordance with local building code and authorities having jurisdiction (AHJ).
- C. Water-Resistive Breathable Barrier: Woven, polyolefin fabric sheet in accordance with ASTM D779, 60-minute water resistance.
- D. Drainable Barrier Sheet: Nonwoven and nonperforated polypropylene material with 1/16 inch gap created by spacers providing drainage space.
 - 1. Width: 3 feet, minimum.
 - 2. Water Vapor Permeance: 18 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
 - 3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 120 days of weather exposure.
 - 4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
 - 5. Seam and Perimeter Tape: As recommended by sheet manufacturer.
 - 6. Products:
 - a. Dupont Tyvek. Tyvek Commercial Wrap D. www.dupont.com.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORIES

- A. Seal and Perimeter Tapes: As recommended by water-resistive barrier manufacturer.
- B. Flashings and Sealants: As recommended by water-resistive barrier manufacturer for application.
- C. Metal Flashings: See Section 076200.
- D. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and weather barrier materials.
 - 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch nominal thickness.
 - 2. Color: Match adjacent finish..

2.03 FASTENERS

- A. Fasteners for Attaching Water-Resistive Barriers to Substrates: As recommended by barrier manufacturer for application.
- B. Self-Sealing Washers: Solid plastic, 2 inch diameter washers; seals building-wrap air barriers against air penetration.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Mechanically Fastened Sheets:

1. Install sheets in shingle fashion to shed water; align horizontally.
2. Overlap seams as recommended by manufacturer, 6 inches, minimum.
3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
4. Install water-resistive barrier over jamb flashings.
5. Install head flashings under water-resistive barrier.
6. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Owner's Inspection and Testing: Cooperate with Owner's testing agency.
 1. Allow access to work areas and staging.
 2. Notify Owner's testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
 3. Do not cover work of this section until testing and inspection is accepted.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 072726 – FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vapor-permeable, fluid-applied air barriers.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 - 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Field quality-control reports, if required.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.
 - 3. Install per the manufacturer's written requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 - 1. BASF Corporation; Beachwood, OH; phone 800-628-9990; www.master-builders-solutions.basf.us/en-us.
 - 2. Prosoco; Lawrence, KS; phone 800-255-4255; www.prosoco.com.
 - 3. Sto Corporation; Atlanta, GA; phone 800-221-2397; www.stocorp.com
- B. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.3 LOW-BUILD AIR BARRIERS, VAPOR PERMEABLE

- A. Low-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 6- to 15-mils (1.5- to 0.38-mm) over smooth, void-free substrates.

1. Physical and Performance Properties:

- a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E2178.
- b. Vapor Permeance: Minimum 10 perms (580 ng/Pa x s x sq. m); ASTM E96/E96M, Desiccant Method, Procedure A.
- c. Ultimate Elongation: Minimum 250 percent; ASTM D412, Die C.
- d. Adhesion to Substrate: Minimum 16 lbf/sq. in. (110 kPa) when tested according to ASTM D4541.
- e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- f. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, 0.0187 inch (0.5 mm) thick, and Series 300 stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 - 3. Verify that substrates are visibly dry and free of moisture.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3-inches (75-mm) of coverage is achieved over each substrate.
 - 3. Unless the manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on the same day. Reprime areas exposed for more than 24 hours.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3-inches (75 mm) of coverage is achieved over each substrate. Maintain 3-inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1-inch (25 mm) of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.
 - F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
 - G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
 - H. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.
 - I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counter-flashings or ending in reglets with termination mastic.
 - J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fish-mouths and blisters. Patch with transition strips extending 6-inches (150-mm) beyond repaired areas in strip direction.
- 3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION
- A. Apply air-barrier materials where indicated on Drawings.
 - B. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 1. Unless the manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 2. Limit priming to areas that will be covered by air-barrier material on the same day. Reprime areas exposed for more than 24 hours.
 3. Where multiple prime coats are needed to achieve the required bond, allow adequate drying time between coats.
 - C. Low-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.
 1. Vapor-Permeable, Low-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, applied in one or more equal coats. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.
 - D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.
- 3.5 FIELD QUALITY CONTROL
- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.

- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Air-barrier dry film thickness.
 3. Continuous structural support of air-barrier system has been provided.
 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 5. Site conditions for application temperature and dryness of substrates have been maintained.
 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
 7. Surfaces have been primed, if applicable.
 8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths.
 9. Termination mastic has been applied on cut edges.
 10. Strips and transition strips have been firmly adhered to substrate.
 11. Compatible materials have been used.
 12. Transitions at changes in direction and structural support at gaps have been provided.
 13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 14. All penetrations have been sealed.
- C. Tests: As determined by testing agency from among the following tests:
1. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.
- D. Air barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 2. Remove and replace deficient air-barrier components for retesting as specified above.
- E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer

than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.

2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
-
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
 - C. Remove masking materials after installation.
 - D. Dispose of used containers and materials in an approved location provided by the contractor.

END OF SECTION 072726

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SECTION 074113 - METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal roof panel system of preformed steel panels.
- B. Metal roof panel system of preformed aluminum panels.

1.02 RELATED REQUIREMENTS

- A. Section 051200 - Structural Steel Framing: Roof framing and purlins.
- B. Section 061000 - Rough Carpentry: Roof sheathing.
- C. Section 072100 - Thermal Insulation: Rigid roof insulation.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- C. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2017).
- D. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995 (Reapproved 2018).
- E. ASTM E1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems; 2016 (Reapproved 2022).
- F. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Storage and handling requirements and recommendations.
 - 2. Installation methods.
 - 3. Specimen warranty.
- C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
 - 1. Show work to be field-fabricated or field-assembled.
- D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- E. Test Reports: Indicate compliance of metal roofing system to specified requirements.
- F. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section and with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.07 FIELD CONDITIONS

- A. Do not install metal roof panels when surface, ambient air, or wind chill temperatures are below 45 degrees F.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Architectural Metal Roof Panel Manufacturers:
 - 1. MBCI, a Cornerstone Building Brands Company; PBC: www.mbc.com/#sle.
 - 2. McElroy, www.mcelroymetal.com
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
 - 1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
 - 2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
 - 3. Wind Uplift: Class 90 wind uplift resistance of UL 580.
 - 4. Air Infiltration: Maximum 0.06 cfm/sq ft at air pressure differential of 6.24 lbf/sq ft, when tested according to ASTM E1680.
 - 5. Water Penetration: No water penetration when tested in accordance with procedures and recommended test pressures of ASTM E1646; perform test immediately following air infiltration test.
 - 6. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

2.03 METAL ROOF PANELS

- A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
 - 1. Steel Panels:
 - a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.
 - b. Steel Thickness: Minimum
 - 2. Aluminum Panels:
 - a. Alloy and Temper: Aluminum complying with ASTM B209/B209M; temper as required for forming.
 - b. Thickness: Minimum 20 gauge, 0.032 inch.
 - 3. Profile: Standing seam, with minimum 1-inch seam height; concealed fastener system for field seaming with special tool.
 - 4. Texture: Smooth.
 - 5. Width: Maximum panel coverage of 24 inches.
- C. CORRUGATED METAL WALL AND ROOF PANELS (**CM1 & CM2**)
 - 1. Provide factory-formed, corrugated metal wall and roof panels designed to be installed by lapping edges of adjacent panels and mechanically attaching panels to supports along lap

joints. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

- a. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
2. Factory-formed, Corrugated Metal Roof & Wall Panels (**CM1 & CM2**):
 - a. Basis of Design Product:
 - 1) Subject to compliance with requirements, provide '**Multi-Cor**' panels by **McElroy Metal, Inc.** or Owner and Architect approved comparable product. Reference vendor information on the drawings.
 3. Metallic-Coated Steel Sheet: Galvalume Plus (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ55 (Class AZM150) coating designation; structural quality. Pre-finished by the coil-coating process to comply with ASTM A755/A755M.
 - a. Interior Locations – Nominal Thickness: 26-gauge sheet thickness (**CM1**).
 - b. Exterior Locations - Nominal Thickness: 22-gauge sheet thickness (**CM2**).
 - c. Color and Finish: Galvalume Plus Finish front and back sides – no paint finish. with manufacturer's standard acrylic clear coat.
 - d. Profile: Longitudinal ribs 7/8" (22.2 mm) deep, spaced 2.67" (68 mm) on center, 35 1/2" sheet width; 31 3/8" (813 mm) cover width.
 - e. Forming: Use continuous end rolling method for panels. No end laps are permitted on panels without Owner approval. It is the intent of the Architect and Owner to provide factory-manufactured panel systems only for this project.

2.04 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.05 FABRICATION

- A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.06 FINISHES

2.07 ACCESSORIES

- A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
 1. Downspouts: Open face, rectangular profile.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.
- C. Sealants:
 1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
 2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
 3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.
- B. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.
- C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.
- D. Protect surrounding areas and adjacent surfaces from damage during execution of this work.
- E. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
 - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
 - 2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.
- B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
- C. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.
 - 1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by panel manufacturer.
 - 2. Provide concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
 - 3. Provide for structural and thermal movement of work.

3.04 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 075400 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Mechanically attached system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Vapor retarder.
- D. Deck sheathing.
- E. Cover boards.
- F. Flashings.
- G. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

- A. Section 053100 - Steel Decking: Placement of acoustical insulation for deck flutes.
- B. Section 061000 - Rough Carpentry: Wood cant strips.
- C. Section 077100 - Roof Specialties: Prefabricated roofing expansion joint flashing.

1.03 REFERENCE STANDARDS

- A. ASTM D4434/D4434M - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing; 2021.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
- C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Testing firm's qualification statement.
- J. Specimen Warranty: For approval.
- K. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this section with at least three years of documented experience.

- C. Testing Firm Qualifications: Company specializing in performing work of the type specified and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.
- C. Store materials in weather protected environment, clear of ground and moisture.
- D. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- E. Protect foam insulation from direct exposure to sunlight.

1.07 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above ____ degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. For repair and replacement include costs of both material and labor in warranty.
 - 3. Exceptions are not Permitted:

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 - 1. GAF; EverGuard TPO 60 mil: www.gaf.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Insulation:
 - 1. GAF; ____: www.gaf.com/#sle.
- C. Cover Boards:
 - 1. GAF EnergyGuard:EnergyGuard HD-MA - Polyiso Cover Board. www.gaf.com
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 ROOFING - UNBALLASTED APPLICATIONS

- A. Thermoplastic Membrane Roofing: One ply membrane, mechanically fastened, over insulation.
- B. Acceptable Insulation Types - Constant Thickness Application: Any of types specified.
 - 1. Minimum 2 layers of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
 - 2. Bottom layer of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, composite, or cellular glass board covered with single layer of cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.

- C. Acceptable Insulation Types - Tapered Application: Any of types specified.
 - 1. Tapered polyisocyanurate, perlite, or extruded polystyrene board.
 - 2. Tapered polyisocyanurate, perlite, extruded polystyrene, or cellular glass board covered with uniform thickness cellulose, perlite, molded polystyrene, polyisocyanurate, glass fiber, extruded polystyrene, or composite board.
 - 3. Uniform thickness cellulose, perlite, composite, polyisocyanurate, extruded polystyrene, molded polystyrene, glass fiber, or cellular glass board covered with tapered polyisocyanurate, extruded polystyrene, or perlite board.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
 - 1. PVC: Polyvinyl chloride (PVC) complying with ASTM D4434/D4434M, Type II, sheet contains reinforcing fibers or reinforcing fabrics.
 - a. Thickness: 40 mil, 0.040 inch, minimum.
 - 2. Sheet Width:
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane.

2.04 DECK SHEATHING

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and exterior penetrations.
- B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

- A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.
- F. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products; 2018.
- G. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.
- H. ASTM B32 - Standard Specification for Solder Metal; 2020.
- I. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- J. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2022.
- K. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2020.
- L. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- M. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008 (Reapproved 2023).
- N. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).
- O. CDA A4050 - Copper in Architecture - Handbook; current edition.
- P. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples, 2 by 2 inches in size, illustrating metal finish color.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sheet Metal Flashing and Trim:
 - 1. ALUCOBOND by 3A Composites USA; ALUCOBOND AXCENT: www.alucobondusa.com/#sle.
 - 2. Fairview Architectural LLC: www.fairview-na.com/#sle.
 - 3. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
 - 4. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.

2.02 SHEET MATERIALS

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.
- B. Anodized Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 0.032 inch thick; anodized finish of color as selected.
 - 1. Color Anodized Finish: AAMA 611, AA-M12C22A42/44, Class I, integrally or electrolytically colored anodic coating not less than 0.7 mil, 0.0007 inch thick.
 - a. Color: As selected by Architect from manufacturer's standard colors.
- C. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 - Brushed finish.

2.03 PREFINISHED ALUMINUM SHEETS

- A. Aluminum Sheet Substrates: ASTM B209/B209M, alloy and temper as recommended by manufacturer for application.
- B. High-Performance Organic Coating System: Comply with AAMA 2604 for aluminum preparation, pretreatment, primer and finish coat system; provide thermally cured, 50-percent PVDF or silicone-modified polyester systems; tested for weathering for 5 years with 5 delta units color change maximum.
- C. Application: _____.
 - 1. Drawing Detail: As indicated on drawings.
 - 2. Base Metal Thickness: 0.040 inch, minimum.
 - 3. Coating System: High-performance organic coating system.
 - 4. Color: As selected by Architect from manufacturer's standard colors.

2.04 FLASHING

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- B. Polyvinyl butyral lead or copper replacement flashing with recycled safety foil glass, 118-mil, 0.118-inch thick roll in accordance with ASTM D1876.
 - 1. Products:

2.05 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.

- B. Underlayment: Polyethylene, 6 mil, 0.006 inch thick.
- C. Primer Type: Zinc chromate.
- D. Concealed Sealants: Non-curing butyl sealant.
- E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- F. Fenestration Perimeter Flashing Attachments: Two-piece flashing receiver and clip of extruded aluminum, at least 0.045 inch thick, for attaching flashing at perimeter of exterior wall fenestration openings.
 - 1. Provide flashing receiver profile appropriate for flashing applications.
- G. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Exterior Flashing Receivers: Install in accordance with manufacturer's recommendations, and in proper relationship with adjacent construction, and as follows:
 - 1. Secure receiver at perimeter of wall opening with adhesives or fasteners.
- E. Seal metal joints watertight.
- F. Secure gutters and downspouts in place with concealed fasteners.
- G. Slope gutters 1/4 inch per 10 feet, minimum.
- H. Connect downspouts to downspout boots, and grout connection watertight.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 077100 - ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured roof specialties, including copings, fascias, and gravel stops.

1.02 RELATED REQUIREMENTS

- A. Section 077200 - Roof Accessories: Manufactured curbs, roof hatches, and snow guards.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- E. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.
- F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- H. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- J. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- K. NRCA (RM) - The NRCA Roofing Manual; 2025.
- L. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Edge Flashings and Copings:
 - 1. Architectural Products Co: www.archprod.com/#sle.
 - 2. ATAS International, Inc: www.atas.com/#sle.
 - 3. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
- B. Counterflashings:
 - 1. ATAS International, Inc: www.atas.com/#sle.
 - 2. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
- C. Pipe Penetration Wall Seal and Insulation Protection System:

1. Airex Manufacturing, Inc; Airex Pro-System Kit: www.airexmfg.com/#sle.

2.02 COMPONENTS

- A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 1. Configuration: Fascia, and edge securement for roof membrane.
 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
 3. Exposed Face Height: As indicated on drawings.
 4. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
 5. Finish: Anodized natural (clear).
 6. Finish: Mill finish.
 7. Color: As selected by Architect from manufacturer's standard range.
 8. Products:
 - a. Hickman Edge Systems; Drip Edge Fascia: www.hickmanedgesystems.com/#sle.
 - b. Metal-Era Inc; Anchor-Tite Drip Edge: www.metalera.com/#sle.
- B. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
 3. Wall Width: As indicated on drawings.
 4. Outside Face Height: As indicated on drawings.
 5. Inside Face Height: As indicated on drawings.
 6. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
 7. Color: As selected by Architect from manufacturer's standard range.
 8. Products:
 - a. ATAS International, Inc: www.atas.com/#sle.
 - b. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
 - c. Metal-Era Inc: www.metalera.com/#sle.

2.03 FINISHES

- A. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mil, 0.0007 inch thick.

2.04 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.
 1. See Section 077200 for information on roofing related accessories.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- D. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

- E. Coordinate installation of flashing flanges into reglets.

END OF SECTION

SECTION 077200 - ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof curbs.
- B. Roof hatches.
- C. Snow guards.

1.02 RELATED REQUIREMENTS

- A. Section 077100 - Roof Specialties: Other manufactured roof specialty items.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
 - 1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.
 - 2. Snow Guards: Submit design calculations for loadings and spacings based on manufacturer testing.
 - 3. Submit shop drawings sealed and signed by a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.05 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 ROOF CURBS

- A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
 - 1. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
 - 2. Sheet Metal Material:
 - a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
 - 3. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
 - a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch clearance between curb and metal roof panel flange allowing water to properly flow past curb.
 - b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.

- c. Maintain at least 12 inch clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
- d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.

2.02 SNOW GUARDS

- A. Fence Type Snow Guard: Continuous snow guard; manufacturer's standard pipe, bar, channel, or solid rod, set in brackets or posts, with optional plates and metal trim to match roof.
 - 1. Products:
 - a. TRA Snow and Sun: www.trasnowandsun.com/#sle.
 - b. Standing Sema Metal Roof, 2-Rail System:
 - 1) Model C-2-2--Z, accepts (2) 3/4 inch diameter pipes. Sprcifically for use on standing seam metal roofing.
 - c. Corrugated Metal Roof, 1-Rail System:
 - 1) Model D1H, Deck mount, 2-rail, accepts (2) 1-inch diameter pipes. Specifically for use on corrugated metal roofing.
 - d. Corrugated Metal Roof, 2-Rail System:
 - 1) Model D-2HL, Deck mount, 2-rail, accepts (2) 1-inch diameter pipes. Specifically for use on corrugated metal roofing
 - e. Substitutions: Not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

- A. Clean installed work to like-new condition.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hilti, Inc.
 - b. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Non-staining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Latex joint sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Sample warranties.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in performing the Work of this Section with a minimum five years documented experience and approved by manufacturer.

1.5 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
 - 1. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 - 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range to match finished surfaces.

2.2 MANUFACTURERS

- A. Silicone Joint Sealants:
 - 1. BASF Construction Chemicals – Building Systems.
 - 2. Bostik, Inc.
 - 3. Dow Corning
 - 4. GE Plastics
 - 5. Momentive Performance Materials, Inc. (formerly GE Silicones)
 - 6. Pecora Corporation
 - 7. Tremco
- B. Polyurethane Sealants:
 - 1. BASF Construction Chemicals – Building Systems
 - 2. Bostik, Inc.
 - 3. Pecora Corporation
 - 4. Tremco
- C. Butyl Sealants:
 - 1. Bostik, Inc.
 - 2. Pecora Corporation
 - 3. Tremco
- D. Acrylic Emulsion Latex Sealants
 - 1. BASF Construction Chemicals – Building Systems
 - 2. Bostik, Inc.
 - 3. Pecora Corporation
 - 4. Tremco

2.3 SEALANTS – INTERIOR

A. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.

1. Color: Standard colors matching finished surfaces.
2. Products:
 - a. Tremflex 834 by Tremco.
 - 1) Applications:
 - a) Interior wall and ceiling control joints.
 - b) Concrete slab joints.
 - c) Other interior joints for which no other type of sealant is indicated.
 - b. MM-80 Semi-Rigid Epoxy Joint Filler by Metzger McGuire
 - 1) Applications:
 - a) Concrete slab joints.

B. Tile Sealant: Silicone; ASTM C 920, Uses I, M and A; single component, mildew resistant.

1. Colors: See under applications.
2. Products:
 - a. Tremsil 200 by Tremco.
 - b. Omniplus by BASF.
 - c. 898 Silicone by Pecora.
 - d. Approved Equal.
3. Applications:
 - a. Joints between countertops and wall surfaces. Color: Clear.
 - b. Joints between plumbing fixtures and floor and wall surfaces. Color: Clear.
 - c. Vertical inside corners of wall tile in Restrooms. Color to match tile grout.

C. Silicone Sealant: ASTM C 920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.

1. Color: Standard colors matching finished surfaces.
2. Products:
 - a. Tremsil 600 by Tremco.
 - b. Omniseal 50 by BASF.
 - c. Approved Equal.
3. Movement Capability: +/- 25%.
4. Application:

- a. Joints in aluminum storefront framing system.
- b. Joints in skylight framing system.

D. Fire Caulk:

- 1. The caulk shall be a one-part, intumescent, latex elastomer. Applicable to overhead, vertical and horizontal firestops.
 - a. Capable of expanding a minimum of 3 times at 1000°F. The material shall be thixotropic.
 - b. Listed by independent test agencies such as UL or FM and be tested to, and pass the criteria of, ASTM E 814 Fire Test, tested under positive pressure. It shall comply with the requirements of the NEC (NFPA-70), BOCA, ICC and NFPA Code #101.

2.4 SEALANTS – EXTERIOR

- A. General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single, or multi- component.
 - 1. Color: To match adjacent surfaces.
 - 2. Products:
 - a. Sonolastic SL-1, or Sonolastic NP2 by BASF.
 - b. Dymeric 240FC by Tremco
 - c. Approved equal.
 - 3. Applications:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Tiltwall Joints.
 - e. Other exterior joints for which no other sealant is indicated.

2.5 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

END OF SECTION 079200

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SECTION 081113 - HOLLOW METAL DOORS AND FRAMES (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hollow-metal work.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required.
- E. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those indicated on Drawings.

1.4 REQUIRED VENDOR

- A. Refer to Drawings for list of Owner's Required Vendor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door; an ASSA ABLOY Group Company.
 - 2. Curries Company; an ASSA ABLOY Group Company.
 - 3. Fleming Door Products Ltd.; an ASSA ABLOY Group Company.
 - 4. HMF Express.
 - 5. Steelcraft; an Allegion brand.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and

temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- C. Utilize FM Approved Fire Doors, Frames and Accessories as noted under FM Approval Class Number 4100 as applicable for use.

2.3 INTERIOR DOORS AND FRAMES

- A. Interior Doors and Frames: ANSI/SDI A250.8, Level 2, Heavy Duty Commercial.
 1. Physical Performance: Level B according to ANSI/SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042-inch, 18-gauge, heavy duty.
 - d. Edge Construction: Model 1.
 - e. Core: Manufacturer's standard.
 3. Frames:
 - a. Materials: Uncoated, steel sheet, minimum thickness of 0.053-inch, 16-gauge, heavy duty.
 - b. Construction: Face welded.
 4. Exposed Finish: Factory Primed.
- B. Gun Vault Door and Frame: ANSI/SDI A250.8, Level 3, Extra Heavy-Duty Commercial.
 1. Physical Performance: Level B according to ANSI/SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053-inch, 16-gauge, extra heavy duty.
 - d. Stile and Head: 5-5/8-inches Wide
 - e. Bottom Rail: 12-5/8-inches High
 - f. Core: Manufacturer's standard.
 3. Frames:

- a. Materials: Uncoated, steel sheet, minimum thickness of 0.067-inch, 14-gauge, extra heavy duty.
 - b. Construction: Face welded.
- 4. Exposed Finish: Factory Primed.
- C. Interior Impact Resistant Door Frames: ANSI/SDI A250.8, Level 2, Heavy Duty Commercial.
 - 1. Doors:
 - a. Type, Thickness, Face, Core, etc.: Ref Spec Section 082100 "Impact Resistant Interior Doors and Door Frame Protectors".
 - 2. Frames:
 - a. Materials: Uncoated, steel sheet, minimum thickness of 0.053-inch, 16-gauge.
 - b. Construction: Full profile welded.
 - c. Exposed Finish: Factory Primed

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Exterior Doors and Frames: ANSI/SDI A250.8, Level 4, Maximum Duty Commercial.
 - 1. Physical Performance: Level B according to ANSI/SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053-inch, 16-gauge, with minimum A40 coating.
 - d. Edge Construction: Model 1.
 - e. Core: Polyurethane.
 - 3. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than R-11 when tested according to ASTM C 1363, or as required by the IECC for the project site, whichever is more stringent.
 - 4. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053-inch, 16-gauge, with minimum A40 coating.
 - b. Construction: Face welded.
 - 5. Exposed Finish: Factory Primed.
- B. Receiving Area Pair of Doors and Frame – Where applicable: ANSI/SDI A250.8, Level 3, Extra Heavy-Duty Commercial. (Replacement of existing doors and frame in existing opening with new door and frame.)
 - 1. Physical Performance: Level B according to ANSI/SDI A250.4.

2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053-inch, 16-gauge, with minimum A40 coating.
 - d. Edge Construction: Model 1.
 - e. Core: Polyurethane.
3. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than R-11 when tested according to ASTM C 1363, or as required by the IECC for the project site, whichever is more stringent.
4. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053-inch, 16-gauge, with minimum A40 coating.
 - b. Construction: Face welded.
5. Exposed Finish: Factory Primed.
6. Door specific instructions:
 - a. Verify egress door width requirements.
 - b. Field verify existing door opening size.
 - 1) For pair of 3'-0" x 7'-0" Doors (6'-4" wide x 7'-2" or 7'-4" high Rough Opening): Provide new door and frame to fit existing size.
 - 2) For smaller than 6'-4" rough opening, provide (1) 3'-0" wide leaf and (1) smaller leaf. 3'-0" wide leaf to have panic hardware for egress; OR; coordinate with structural to widen existing opening to fit pair of 3'-0" wide doors.
 - c. Provide power for new electrified hardware, if required – refer to door hardware requirements.
 - d. Center mullion or removable mullion is not acceptable.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Stud-Wall Type: Designed to engage stud, not less than 0.042-inch thick.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042-inch, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).
- I. Glazing: Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Supplied and installed in field by installer.

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tropical-cyclone resistant construction is required for exterior doors and their hardware, at all locations with a design wind speed of 100 mph (ASCE 7-05) or greater per FM Global Data Sheet 1-28.
 - 1. This includes but is not limited to doors, windows, skylights, loading dock doors and louvers.
 - 2. Refer to FM Global Data Sheet 1-28 for design requirements.
 - 3. Refer to structural drawings for wind speed and wind pressure loads for project site.
 - 4. Forward the following information to FM Global for review:
 - a. Cut sheets and product information for all exterior openings (Doors, windows, skylights, overhead coiling doors, louvers, etc.) indicating their ASTM design standards, tropical-cyclone resistant construction, and missile impact resistance.
- C. Hollow-Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 2. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.
- D. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 3. Provide foamed framed at tilt wall at all hardware locations.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches O.C. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in ANSI/SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Provide fixed frame moldings on outside of exterior doors, and on secure side of interior doors and frames.

3. Provide loose stops and moldings on inside doors of hollow-metal work.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: ANSI/SDI A250.10.

2.9 ACCESSORIES

- A. Louvers: Provide sight-proof, lightproof louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.
- B. Grout Guards: Formed from same material as frames, not less than 0.016-inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing anti-freezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Tilt-Up Concrete Walls: Cast frames in panels with full concrete fill foamed for hardware installation.
 5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus, or minus 1/16-inch, measured at door rabbet on a line 90-degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus, or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus, or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus, or minus 1/16-inch, measured at jambs at floor.
- B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8-inch plus or minus 1/32-inch.
 - b. Between Edges of Pairs of Doors: 1/8-inch to 1/4-inch plus or minus 1/32-inch.
 - c. At Bottom of Door: 3/4-inch plus or minus 1/32-inch.
 - d. Between Door Face and Stop: 1/16-inch to 1/8-inch plus or minus 1/32-inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9-inches O.C. and not more than 2-inches O.C. from each corner.

3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

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SECTION 082100 – IMPACT RESISTANT INTERIOR DOORS AND DOOR FRAME PROTECTORS

(REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Acrovyn® Door Systems doors with flush faces, non-rated.
2. Acrovyn® Door Systems doors with flush faces, rated.
3. Acrovyn® Door Frame Protectors for metal door frame.

1.2 REFERENCES

- A. ASTM E152 – Methods of Fire Tests and Door Assemblies
- B. NFPA 252 Standard Methods of Fire Tests of Door Assemblies
- C. UL-10C Positive Pressure Fire Tests of Door Assemblies.
- D. UL-9 Standard for Fire Tests of Window Assemblies.
- E. NFPA 80 Fire Doors and Windows
- F. NFPA 257 Standard on Fire Test for
- G. NFPA 101 Life Safety Code
- H. ANSI/WDMA Industry Quality Test Standards I.S.1A-04:
 1. WDMA TM-6 - Test method for determining the durability of adhesives used in doors under accelerated aging conditions.
 2. WDMA TM-07 - Test method to determine the physical endurance of wood doors & associated hardware connections under accelerated operating conditions, Window and Door Manufacturers Association.
 3. WDMA TM-08 - Test methods to determine hinge loading resistance of wood door stiles, Window and Door Manufacturers Association.
 4. WDMA TM-10 – Test method to determine the screw holding capacity of wood door stiles, Window and Door Manufacturers Association.
- I. ANSI/BHMA A 156.115-W-2006 American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames.
- J. FSC – Forestry Stewardship Council

1.3 ACTION SUBMITTALS

- A. Submit in accordance with Section 013300 – Submittal Procedures.
- B. Product Data: For each type of door, submit manufacturer's data sheets including detail of core and edge construction.
- C. Shop Drawings: Include elevations, core construction, door edge details, construction details not covered in product data, frame profiles, preparations for hardware, and other pertinent information. Include dimensions and locations of mortises and hole for

hardware, fire ratings (where applicable) and locations of cutouts for glass and louvers (where applicable).

- D. Schedule: Submit complete schedule indicating location, size, hardware sets, and swings of each door. Schedule to be prepared by supplier using same reference numbers for details and openings as those indicated on Drawings and in the specifications.
- E. Samples for Initial Selection: For factory-applied color finishes.
- F. Samples for Verification: For factory-applied color finish as specified. For verification of edge wrapping and edge replaceability. BANDED EDGES WILL NOT BE APPROVED.
- G. Certification: For all fire rated doors and frames, submit certification that doors and frames comply with UL 10c, Positive Pressure Fire Door Test Method.
- H. Manufacturer's limited Lifetime warranty.

1.4 REQUIRED VENDOR

- A. Doors, Frames and Acrovyn® Door Frame Covers supplied by Door/Frames Required Vendor as listed on the VC1 sheet in the Drawings. NO SUBSTITUTIONS.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain high impact resistant Acrovyn® Door Systems flush doors through one source from a single manufacturer.
- B. Quality Standard: Comply with ANSI/WDMA Industry Standard (I.S. 1A-04 "Architectural Wood Flush Doors").
 - 1. Doors shall meet performance attributes for the following performance duty level: Extra Heavy Duty (Standard Duty for FC5-NR)
 - 2. Tolerances for warp, telegraphing, squareness and pre-fitting dimensions as per the latest edition of ANSI/WDMA I.S. 1A-04.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-ratings indicated, based on testing according to UBC Standard 7-2, UL-10C Positive Pressure and NFPA 252.

1.6 TRANSPORT, STORAGE, HANDLING AND SITE CONDITIONS

- A. Transport, store, protect and handle products under guidelines of ANSI/WDMA and manufacturer's care and handling instructions.
- B. Package doors individually using foam interleaf and stack on pallet, not exceeding 15 doors per pallet.
- C. Mark each door with opening number used on shop drawings.
- D. Accept doors on site in manufacturer's standard packaging. Inspect for damage.
- E. Do not store doors in damp or wet areas. HVAC systems should be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25% or greater than 55%.

- F. Do not subject doors to extreme conditions or changes in heat, dryness, or humidity in accordance with the latest edition of ANSI/WDMA I.S.1A-04.
- G. Protect doors from exposure to natural and artificial light after delivery.
- H. Doors should be lifted and carried when being moved, not dragged across one another.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver store, or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. HVAC systems should be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25% or greater than 55%. Note: Any claim for warp, bow, twist, or telegraphing may be denied if required humidity requirements are not maintained.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that are deemed defective in materials or workmanship. Conditions are subject to the terms set forth in the manufacturer's warranty.
 - 1. Solid-Core Interior Doors: provide manufacturer's limited lifetime written warranty guarantee against warp, delamination and defects in materials and workmanship.
 - 2. "Edge of a Lifetime" Warranty: If an Acrovyn edge cover is ever damaged, Construction Specialties shall supply a replacement Acrovyn cover at no cost to the Owner. This special warranty begins 1 month after the installation date. Labor not included. Stainless Steel edges not included. See website for more details at www.c-sgroup.com.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Construction Specialties, Inc. Acrovyn® Door Systems; (800) 972-7214
 - 2. NO SUBSTITUTIONS.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable

to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- C. Utilize FM Approved Fire Doors, Frames and Accessories as noted under FM Approval Class Number 4100 as applicable for use.

2.3 INTERIOR IMPACT RESISTANT DOOR MATERIALS AND CONSTRUCTION

A. Impact Resistant Interior Non-Fire-Rated Flush Doors

1. Performance Duty Level: ANSI/WDMA I.S. 1A-04, Extra Heavy Duty.
2. Type: As indicated in the Door Schedule on the drawings. Note: Pocket Door shall be Model PC5-NR: 4'-3" W x 7'-0" H with 8" W x 36" H vision lite. Color: #136 Pearl Gray. See Section 087111 – Hardware Set #11 for hardware kit components and requirements.
3. Thickness: 1-3/4-inches.
4. Core: Solid. Interior stiles and rails bonded. Tops and bottoms factory sealed with an approved sealer to prevent moisture intrusion.
 - a. Particleboard Grade LD-1, 32 lb./ft³ density, ANSI A208.1.2009, CARB Phase 1 compliant or,
 - b. FSC Certified Particleboard Grade LD-1, 32 lb./ft³ density, ANSI A208.1.2009, CARB Phase 1 compliant or,
 - c. Agrifiber Particleboard Grade LD-1, 26-28 lb./ft³ density – rapidly renewable and no added area formaldehyde content, CARB Phase 1 compliant or,
 - d. Structural composite Lumber, 39 lb./ft³ density – no added urea formaldehyde content.
5. Replaceable Door Stiles: 3/4-inch replaceable stiles shall be field replaceable if ever damaged by impact.
6. Door Stiles: To meet or exceed the following performance testing to ensure hardware fastener holding strength:
 - a. WDMA TM-8 "Hinge Loading Resistance" Extra heavy Duty
 - b. WDMA TM-10 "Screw Holding Capacity" Extra Heavy Duty.
7. Crossband: FSC Certified
8. Adhesives:
 - a. Crossbanding to core adhesives shall be Type II, urea formaldehyde free I to improve structural integrity of door.
 - b. Door faces are to be applied to the crossbanded core using Type I, urea formaldehyde free adhesives to eliminate delamination.
9. Face:
 - a. Finish

- 1) "Suede" solid color impact resistant, PVC-free Acrovyn®.
 - 2) Exposed finish to be "Pearl Gray" #136.
 - 3) Face material base color must be integral throughout to eliminate discoloration caused by scratching.
 - 4) Face Veneer Wear Index – Abrasion Resistance Testing - ASTM D4060-90: 28,000 cycles to prove out resistant to scuffing and scratching.
 - 5) Face Veneer Impact Resistance – ASTM D-4226 86in/lb. to conform impact resistance of face finish.
10. Replaceable Door Edges: Fully wrapped and rounded Acrovyn® door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.
- a. Subject to the terms and conditions of the manufacturer's Limited Warranty for the lifetime of the doors, the manufacturer shall supply replacement Acrovyn® edge covers AT NO COST to the owner.
11. Door Edges:
- a. Finish
 - 1) Edges of door to be PVC -free impact resistant Acrovyn®. "Suede" solid color "Pearl Gray" #136.
 - b. Edges are covered by "Edge of a Lifetime" Lifetime Limited Warranty from Construction Specialties Acrovyn® Door Systems against damage, and begins 1 month after installation, Refer to Warranty for full details.
 - c. Edges are to fully wrap the door vertical stiles to eliminate banded edges thus improving durability and impact resistance.
 - d. Replaceable edges to be 3/4-inch thick for proper edge and face protection.
 - e. Door edges shall be exclusive of fasteners to improve appearance.
 - f. Edges must be flush with face of door thus eliminating residue edges that could be torn off.
 - g. Edges to include 1/4-inch radius edges to improve impact deflection. Square or banded edges should not be permitted.
 - h. Edges are to be extruded (not formed) to ensure correct appearance and proper door fit.
 - i. Edges to be provided as part of the construction of the door from single source manufacturer.
12. Durability Performance: Cycle Slam WDMA TM-7, 1990 Extra Heavy Duty – 1,000,000 cycles to insure durability of entire door construction.

B. Impact Resistant Interior 45- and 60-Minute Fire-Rated Flush Doors

1. Performance Duty Level: ANSI/WDMA I.S. 1A-04, Extra Heavy Duty.
2. Type: As indicated in the Door Schedule on the drawings.
3. Thickness: 1-3/4-inches.
4. Core: Solid. Interior stiles and rails bonded. Non -combustible mineral composite, 25-32 lb./ft³ density, no added urea formaldehyde content. Tops and bottoms factory sealed with an approved sealer to prevent moisture intrusion.

5. Replaceable Door Stiles: 3/4-inch replaceable stiles shall be field replaceable if ever damaged by impact.
6. Door Stiles: To meet or exceed the following performance testing to ensure hardware fastener holding strength:
 - a. WDMA TM-8 "Hinge Loading Resistance" Extra heavy Duty
 - b. WDMA TM-10 "Screw Holding Capacity" Extra Heavy Duty.
7. Crossband: FSC Certified
8. Adhesives:
 - a. Crossbanding to core adhesives shall be Type II, urea formaldehyde free I to improve structural integrity of door.
 - b. Door faces are to be applied to the crossbanded core using Type I, urea formaldehyde free adhesives to eliminate delamination.
9. Face:
 - a. Finish
 - 1) "Suede" solid color impact resistant, PVC-free Acrovyn®.
 - 2) Exposed finish to be "Pearl Gray" #136.
 - 3) Face material base color must be integral throughout to eliminate discoloration caused by scratching.
 - 4) Face Veneer Wear Index – Abrasion Resistance Testing - ASTM D4060-90: 28,000 cycles to prove out resistant to scuffing and scratching.
 - 5) Face Veneer Impact Resistance – ASTM D-4226 86in/lb. to conform impact resistance of face finish.
10. Replaceable Door Edges: Fully wrapped and rounded Acrovyn® door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.
 - a. Subject to the terms and conditions of the manufacturer's Limited Warranty for the lifetime of the doors, the manufacturer shall supply replacement Acrovyn® edge covers AT NO COST to the owner.
11. Door Edges:
 - a. Finish
 - 1) Edges of door to be PVC -free impact resistant Acrovyn®. "Suede" solid color "Pearl Gray" #136.
 - b. Edges are covered by "Edge of a Lifetime" Lifetime Limited Warranty from Construction Specialties Acrovyn® Door Systems against damage, and begins 1 month after installation, Refer to Warranty for full details.
 - c. Edges are to fully wrap the door vertical stiles to eliminate banded edges thus improving durability and impact resistance.
 - d. Replaceable edges to be 3/4-inch thick for proper edge and face protection.

- e. Door edges shall be exclusive of fasteners to improve appearance.
 - f. Edges must be flush with face of door thus eliminating residue edges that could be torn off.
 - g. Edges to include 1/4-inch radius edges to improve impact deflection. Square or banded edges should not be permitted.
 - h. Edges are to be extruded (not formed) to ensure correct appearance and proper door fit.
 - i. Edges to be provided as part of the construction of the door from single source manufacturer.
12. Durability Performance: Cycle Slam WDMA TM-7, 1990 Extra Heavy Duty – 1,000,000 cycles to insure durability of entire door construction.

C. Impact Resistant Interior 90-Minute Fire-Rated Flush Doors

- 1. Performance Duty Level: ANSI/WDMA I.S. 1A-04, Extra Heavy Duty.
- 2. Type: As indicated in the Door Schedule on the drawings.
- 3. Thickness: 1-3/4-inches.
- 4. Core: Solid. Interior stiles and rails bonded. Non-combustible mineral composite, 25-32 lb./ft³ density, no added urea formaldehyde content. Tops and bottoms factory sealed with an approved sealer to prevent moisture intrusion.
- 5. Replaceable Door Stiles: 3/4-inch replaceable stiles shall be field replaceable if ever damaged by impact.
- 6. Door Stiles: To meet or exceed the following performance testing to ensure hardware fastener holding strength:
 - a. WDMA TM-8 "Hinge Loading Resistance" Extra heavy Duty
 - b. WDMA TM-10 "Screw Holding Capacity" Extra Heavy Duty.
- 7. Crossband: Mineral composite.
- 8. Adhesives:
 - a. Crossbanding to core adhesives shall be Type II, urea formaldehyde free I to improve structural integrity of door.
 - b. Door faces are to be applied to the crossbanded core using Type I, urea formaldehyde free adhesives to eliminate delamination.
- 9. Face:
 - a. Finish
 - 1) "Suede" solid color impact resistant, PVC-free Acrovyn®.
 - 2) Exposed finish to be "Pearl Gray" #136.
 - 3) Face material base color must be integral throughout to eliminate discoloration caused by scratching.
 - 4) Face Veneer Wear Index – Abrasion Resistance Testing - ASTM D4060-90: 28,000 cycles to prove out resistant to scuffing and scratching.
 - 5) Face Veneer Impact Resistance – ASTM D-4226 86in/lb. to conform impact resistance of face finish.

10. Replaceable Door Edges: Fully wrapped and rounded Acrovyn® door edges shall be field replaceable if ever damaged by impact, exclusive of external fasteners to improve appearance.
 - a. Subject to the terms and conditions of the manufacturer's Limited Warranty for the lifetime of the doors, the manufacture shall supply replacement Acrovyn® edge covers AT NO COST to the owner.
11. Door Edges:
 - a. Finish
 - 1) Edges of door to be PVC -free impact resistant Acrovyn®. "Suede" solid color "Pearl Gray" #136.
 - b. Edges are covered by "Edge of a Lifetime" Lifetime Limited Warranty from Construction Specialties Acrovyn® Door Systems against damage, and begins 1 month after installation, Refer to Warranty for full details.
 - c. Edges are to fully wrap the door vertical stiles to eliminate banded edges thus improving durability and impact resistance.
 - d. Replaceable edges to be 3/4-inch thick for proper edge and face protection.
 - e. Door edges shall be exclusive of fasteners to improve appearance.
 - f. Edges must be flush with face of door thus eliminating residue edges that could be torn off.
 - g. Edges to include 1/4-inch radius edges to improve impact deflection. Square or banded edges should not be permitted.
 - h. Edges are to be extruded (not formed) to ensure correct appearance and proper door fit.
 - i. Edges to be provided as part of the construction of the door from single source manufacturer.
12. Durability Performance: Cycle Slam WDMA TM-7, 1990 Extra Heavy Duty – 1,000,000 cycles to insure durability of entire door construction.

2.4 FABRICATION, GENERAL

- A. Doors shall be pre-fit and beveled at the factory to fit the openings to reduce handling and onsite labor costs.
 1. Prefit tolerances shall be in accordance with the requirements of ANSI/WDMA I.S.1A-04, latest addition.
 2. For fire-rated doors, comply with clearance requirement of reference quantity standard for fitting in accordance with requirements listed in NFPA 80.
 3. Coordinate measurements of hardware mortises in metal frames. Door Distributor to verify dimensions and alignment before factory machining.
 4. Factory machine doors for hardware that is not surface applied.
 - a. Comply with final hardware schedules, door frame shop drawings, and hardware templates.
 5. Light Openings must be cut by the manufacturer or by a certified machining distributor.

6. To ensure proper fit of the doors, bevel on both strike and hinge edges to be 1/8-inch in 2-inches.
7. Top and bottom rails shall be factory sealed with an approved wood sealer to eliminate moisture from entering the core, thus eliminating warp.
8. Blocking: provide blocking or through-bolting for surface applied hardware.

2.5 ACCESSORIES

A. Louvers:

1. Provide sight-proof, light-proof louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.
2. Prime and Paint PT-12, eggshell finish. Reference Section 099123 "Interior Painting".

B. Glazing Stops

1. Non-Rated

a. Acrovyn® Vision Panel Covers

- 1) Acrovyn®, molded to fit over an All-Metal Stamping Model 110 metal visions frame.
- 2) Adhered to frame with double sided tape-removable to allow frame/glass access.
- 3) Acrovyn® Panel cover finish matched Acrovyn® door face finish.

2.6 DOOR FRAME WRAP MATERIALS AND CONSTRUCTION

A. Fabricate Door Frame Protectors to be type B1 Extended Frame. Frame Protectors to be formed, rigid and free of defects, warp, or buckle. Accurately form door frame protectors to required sizes and profiles, with minimum radius for material thickness.

B. Coordinate measurements of hardware mortises in metal frames with Acrovyn® Door Frame Protectors. Door Distributor to verify dimensions and alignment before factory machining Acrovyn® Door Frame Protectors.

C. Finish

1. "Suede" solid color impact resistant, PVC-free Acrovyn®.
2. Exposed finish to be "Pearl Gray" #136.
3. Face material base color must be integral throughout to eliminate discoloration caused by scratching.
4. Face Veneer Wear Index – Abrasion Resistance Testing - ASTM D4060-90: 28,000 cycles to prove resistance to scuffing and scratching.
5. Face Veneer Impact Resistance – ASTM D-4226 86in/lb. to conform impact resistance of face finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect all doors prior to hanging. Repair noticeable marks or defects that may have occurred from improper storage or handling. Field repairs and touchups are the responsibility of the installing contractor upon completion of the initial installation. Field touchups shall include repair of job inflicted mars and final cleaning of finished doors.
- B. Examine door frames and verify that they comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
- C. Adjust frames to plumb condition before door installation. Tolerances for warp, squareness and pre-fitting dimensions shall be as per latest edition of ANSI/WDMA I.S.1A-04.
- D. Do not install doors in frame openings that are not plumb or are out of tolerance for size and alignment.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Handle doors in accordance with recommendations of ANSI/WDMA I.S.1A-04.
- B. Condition doors to average temperature and humidity in area of installation for not less than 48 hours prior to installation.
- C. Install door to comply with manufacturer's written instructions, referenced quality standard and as indicated.
- D. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80 and ITS-WH requirements.
- E. Factory fitted doors: Align in frames for uniform clearance at each edge.
- F. Set doors plumb, level, square and true.
- G. In the field trimming:
 - 1. Trim door height by cutting door bottom edges to a maximum of 3/4-inch (19.05 mm) per NFPA 80.
 - 2. Trimming of fire rated doors in width can only be done by the manufacturer or a certified machining distributor under special guidance of the manufacturer.
- H. Drill Pilot holes for screws and bolts using templates provided by hardware manufacturer.
- I. Exercise caution when drilling pilot holes and installing hinges so that pilot holes are not over drilled, and screws are not over torqued. Follow manufacturer's installation instructions.

- J. Reseal exposed top and bottom rails of any doors that required site alterations with an approved wood sealer.
- K. Hardware Installation: Reference Section 087111 "Door Hardware".
- L. Hardware Installation at Door Frame Protectors: GC is responsible for all the hardware cutouts and installation of all hardware at door frames/protectors including but not limited to hinges, strikes, closers, silencers, etc.
- M. Hollow-Metal Frames: Reference Section 081113 "Hollow Metal Doors and Frames"
- N. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with Acrovyn® Door manufacturer's written instructions.
- O. Install Acrovyn® Door Frame Protectors over hollow metal frames. Adhere protectors to frame with double-sided removable tape or adhesive, installed per manufacturers recommendations. Field miter corners. Maximum of 1/16-inch gap tolerance at mitered corners. Provide continuous bead of sealant to match Acrovyn® finish where edges of wrap are adjacent to wall finish.

3.3 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective or damaged work, including any impact resistant work that is warped, bowed, or otherwise unacceptable.
- B. Remove excessive sealant material from impact resistant work immediately after installation.
- C. Prime-Coat Touchup at Louvers: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.
- E. Clean prefinished doors with a rag in concert with water or household cleaners such as Fantastic®, Formula 409®, or equivalent. Following use of the cleaner, the cleaned surface should be "rinse wiped" with clean water and wiped dry to remove any remaining residue.

END OF SECTION 082100

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Access doors and frames for walls and ceilings, interior and exterior.
 - 2. Fire-rated access doors and frames.
- B. Related Requirements:
 - 1. Section 092900 – Gypsum Board: Openings in gypsum board ceilings.
 - 2. Section 099123 – Paints and Coatings: Field paint finish.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of access door and frame and for each finish specified.
- C. Product Schedule: For access doors and frames.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

- A. Interior Flush Access Doors with Exposed Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc.
 - b. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.
 - c. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - 2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
 - 3. Locations: Wall and ceiling as required by code.
 - 4. Uncoated Steel Sheet for Door: Nominal 0.060-inch (1.52 mm), 16-gauge, factory primed.
 - 5. Metallic-Coated Steel Sheet for Door: Nominal 0.064-inch (1.63 mm), 16-gauge, factory primed.
 - 6. Frame Material: Same material, thickness, and finish as door.
 - 7. Latch and Lock: Cam latch, screwdriver operated Cam latch, key operated, or as indicated on Drawings.
 - 8. Size: 20"x30" or as required by code.

B. Exterior Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc. – Airtight / Watertight Access Door, Prime coated.
 - b. Babcock-Davis – Coastal Zone Exterior Access Door (Coastal locations only).
 - c. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company. ED Series access panels.
 - d. Nystrom – XTL Series access panels.
2. Description: Face of door flush with frame, with exposed flange and concealed hinge. Fully welded door and frame.
3. Locations: Exterior parapets for signage access from the roof area as required. Soffit access as indicated.
4. Size: As indicated on the drawings or minimum as required by code for type of access.
5. Metallic-Coated Steel Sheet for Door & Frame: Nominal 0.064-inch, 16-gauge, factory primed. Minimum 1" thick rigid insulation.
6. Stainless Steel Sheet for Door & Frame: Nominal 0.064-inch, 16-gauge, No. 4 satin finish stainless steel – for use in exterior openings at coastal project site locations. All fasteners & hardware to be type 316 stainless steel. Minimum 1" thick rigid insulation.
7. Weather Seal: Continuous bulb type neoprene gasketing.
8. Hinges: Continuous piano type, concealed.
9. Latch and Lock: Self-latching door hardware with cylinder lock, locked by key to match building exterior door keying. Provide lever type handles for above the roof applications. Provide keyed cylinder lock operation and recessed handle for locations exposed to customer view such as in soffits. Provide extra heavy-duty stainless-steel hardware at hurricane prone locations.

C. Fire-Rated, Flush Access Doors with Exposed Flanges

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc. – Various models as required.
 - b. Babcock-Davis – BUT or BIT Series.
 - c. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company. FR & FRC Series access panels.
 - d. Nystrom – UT or IT Series.
2. Description: Face of door flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal (where required for thermal insulation and at ceilings), with exposed flange, self-closing door, and concealed hinge. Fully welded door and frame.
3. Locations: Wall & Ceiling fire-rated gypsum board and metal stud framing, or concrete/masonry partitions as indicated on the drawings.
4. Fire-Resistance Rating: Not less than that of adjacent construction.

5. Size: As indicated on the drawings or minimum as required by code for type of access.
6. Metallic-Coated Steel Sheet for Doors and Frames: Nominal 0.040 inch (1.02 mm), 20-gauge, factory finished.
7. Stainless Steel Sheet for Door & Frame: Nominal 0.064-inch, 16-gauge, No. 4 satin finish stainless steel – for use at exterior openings at coastal project site locations only. All fasteners & hardware to be type 316 stainless steel. Minimum 1" thick mineral fiber insulation.
8. Weather Seal: Continuous bulb type neoprene gasketing.
9. Hinges: Continuous piano type, concealed.
10. Latch and Lock: Self-latching door hardware with cylinder lock, locked by key to match building exterior door keying. Provide lever type handles for above the roof applications. Provide keyed cylinder lock operation and recessed handles for locations exposed to customer view such as in soffits. Provide extra heavy-duty stainless-steel hardware at hurricane prone locations.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Stainless Steel Plate, Sheet, Flat Bars and Strip: ASTM A240/240M or ASTM A666, Type 316. Remove tool and die marks and stretch lines, or blend into finish.
- E. Frame Anchors: Same material as door face. Provide masonry anchors at concrete or CMU wall construction.
- F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 – or as noted otherwise for coastal applications.

2.3 FABRICATION

- A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Latch and Lock Hardware:
 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 2. Keys: Furnish two keys per lock and key all locks alike.
 3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087111 – "Door Hardware".

2.4 FINISHES

- A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment. Paint to match color of adjacent surface.
 - 2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.
 - a. Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

SECTION 083323 - OVERHEAD COILING DOORS (OWNER REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulated service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
2. Certify compliance with the horizontal wind loads indicated on the structural drawings including the FM Global safety factor of 2.0.
3. Show locations of controls, locking devices, and other accessories.
4. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by the manufacturer for both installation and maintenance of units required for this Project.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

1. Design Wind Load: As indicated on Structural Drawings.
2. Testing: According to ASTM E 330.

- B. Windborne-Debris Impact Resistance: When indicated on the Drawings, provide impact-protective overhead coiling doors that pass missile-impact and cyclic-pressure tests according to ASTM E 1996, where required per Code.

- 1. Large-Missile Test: For overhead coiling doors located within 30 feet of grade.

- C. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. Cornell Storefront Systems, Inc: 140 Maffet Street, Suite 200, Wilkes Barre, PA 18705. Ph 800-882-6773 providing doors manufactured by Cornell Storefront System, Inc.

- 1) Model: ESD20

- B. Curtain R-Value: 8.0.

- C. Door Curtain Material: Galvanized steel.

- D. Door Curtain Slats: Flat profile slats of 3-inch center-to-center height. 22-gauge galvanized steel front with 24-gauge galvanized back slat.

- E. Bottom Bar: Two angles, each not less than 1-1/2-inches by 1-1/2-inches by 1/8-inch thick; fabricated from structural steel, powder coated with exposed finish matching curtain.

- F. Curtain Jamb Guides: Structural steel, powder coated with exposed finish matching curtain slats.

- G. Hood: Match curtain material and finish.

- 1. Mounting: Face of wall.

- H. Locking Devices: Equip door with slide bolt for padlock and chain lock keeper.

- I. Manual Door Operator: Chain-hoist operator.

- J. Curtain Accessories: Equip door with weatherseals, vinyl astragal at bottom bar, exterior vinyl snap on guide weather-stripping and internal neoprene hood baffle.

- K. Door Finish:

- 1. Baked-Enamel or Powder-Coated Finish: RAL 7006 "Beige Grey".
 - 2. Interior Curtain-Slat Facing: RAL 7006 "Beige Grey".

2.3 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
- B. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

2.5 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer. Adjust seals to provide tight fit around entire perimeter.

3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

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SECTION 083457 – SECURITY SHUTTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual operated aluminum security shutters.

1.2 REFERENCES:

- A. ASTM International ASTM B 221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. America Architectural Manufacturers Association AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

1.3 ACTION SUBMITTALS

- A. Product Data: Provide Manufacturer's printed product information identifying all construction components, materials, options and finishes.
- B. Shop Drawings: Show each installation component not dimensioned or detailed in Product Data. Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain security shutters specified in the Section through one source from a single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver security shutters in Manufacturer's original, undamaged and unopened containers. Provide identification labels on each container.
- B. Store security shutters in location provided from weather and damage from construction operations.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of openings where security shutters are indicated to be installed. Indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Warranty: Manufacturer's standard warranty in which manufacturer agrees to replace security shutters that fail in materials or workmanship within specified warranty period.

- 1. Warranty period three (3) years from the date of Substantial Completion.

1.8 CLOSEOUT SUBMITTALS

- A. Warranty, operation and maintenance data.

PART 2 - PRODUCTS

2.1 SECURITY SHUTTER

- 1. Manufacturer: Subject to compliance with requirements, provide products by the following:
 - a. Metro Door
821 Industrial Drive
Lewisburg, TN 37091
(800) 669-3667
Direct Contact: Tanner Sharp (800) 669-3667 x 713
Tanner.Sharp@metrodoor.com
 - b. QMI Security Services
1661 Glenlake Avenue, Itasca, IL 60143
(800) 446-2500
Direct Contact: Julie Perez (630) 945-8907
jperez@qmiusa.com
 - c. Substitutions: Not permitted. Refer to drawings for additional vendor / installer information.

2.2 MATERIALS

- A. Aluminum: Alloy 6063 complying with ASTM B221.
- B. Product: Metro Door Metroguard Window Shutter
- C. Counter-Balance Assembly: Fabricated of tempered, helical, torsion springs with a 25 percent safety factor, mounted on shaped cast anchors and supported by continuous torsion rod. Enclosed assembly in a steel or aluminum pipe shaft. Deflection of shaft not to exceed 0.03-inch per lineal foot.
- D. Hoods: Square, fabricated of aluminum to close entirely the coiled curtain and operating mechanism.
- E. Support Tube: Aluminum Tubes
 - 1. Provide 2-inch x 4-inch aluminum tubes for security shutter at Entry Shutter (101B), Entry Shutter (101D) and Cart Storage Shutter (102B).

- F. Push/Pull handles: For push-up-operated or emergency-operated doors, provide raised lifting handles appropriate to the application.
- G. Multi-Point Locking System: manufacturer's two-point locking system with mortise cylinders
 - 1. Provide tamper-proof thumb-turn on secure side of security shutter at Entry and Exit Room shutters only.
- H. Curtains: Fabricated of solid interlocking, aluminum slats with a flat profile of thickness specified.
 - 1. Size: 2-3/8-inch high by 11/32-inch deep.
- I. Guides: 1-1/2-inch by 2-1/4-inch, two (2) piece extruded aluminum with wool pile inserts to prevent metal-to-metal contact.
- J. Bottom Bars: 1-7/16-inch by 3-inch, (2) two-piece extruded tube.

2.3 FINISHES

- A. Clear Anodic Finish: AA-M12C22A31 Class II complying with AAMA 611.
- B. Fasteners: Any exposed fasteners shall match the finish / color of the adjacent surface. Manufacturer shall minimize exposed fasteners to the maximum extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installation locations and conditions with installer present for compliance with requirements for opening construction and other conditions affecting performance of security shutter assemblies.
- B. Examine locations of electrical connections?
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install security shutters complete with operating equipment, hardware, anchor and supports as required by manufacturer's written instruction and as specified.

3.3 ADJUSTING

- A. Adjust moving components so that assemblies operate smoothly without binding, twisting or other form of distortion.
- B. Test electrical components to ensure components are operating in compliance with manufacturer's performance criteria.

- C. Lubricate bearing and sliding parts as recommended by manufacturer.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate and maintain security shutters.

3.5 CLEANING AND PROTECTION

- A. Clean surfaces of assemblies of oil, grease, dirt and other materials affecting appearance of final installation. Touch up finishes to restore damaged or soiled areas.
- B. Protect installation of assemblies from damage from construction operations.

3.6 COILING SECURITY SHUTTER SCHEDULE

- A. Coiling Security Shutter Assembly (ENTRY SHUTTER 101B)

1. Operation: Manual

- a. Controller Type: Key switch (thumb turn only)
 - 1) Mounting: Recessed on center of the interior side.
- b. Curtain: Solid
- c. Locking System: Two-point
- d. Finish:
 - 1) Curtain: Clear Anodized.
 - 2) Bottom Bar: White Anodized.
 - 3) Other Components not specified: White Anodized.
 - 4) Guides/Tube Supports: White Anodized.
 - 5) Hood: White Anodized.

- B. Coiling Security Shutter Assembly (ENTRY SHUTTER 101D)

1. Operation: Manual

- a. Controller Type: Key switch (key and thumb turn)
 - 1) Mounting: Recessed and offset to right on the exterior side.
- b. Curtain: Solid
- c. Locking System: Two-point
- d. Finish:
 - 1) Curtain: Clear Anodized.
 - 2) Bottom Bar: White Anodized.
 - 3) Other Components not specified: White Anodized.
 - 4) Guides/Tube Supports: White Anodized.
 - 5) Hood: White Anodized.

C. Coiling Security Shutter Assembly (CART STORAGE SHUTTER 102B)

1. Operation: Manual

- a. Controller Type: Key switch (key only)
 - 1) Mounting: Recessed and offset on the exterior side.
- b. Curtain: Solid
- c. Locking System: Two-point
- d. Finish:
 - 1) Curtain: Clear Anodized.
 - 2) Bottom Bar: White Anodized.
 - 3) Other Components not specified: White Anodized.
 - 4) Guides/Tube Supports: White Anodized.
 - 5) Hood: White Anodized.

D. Coiling Security Shutter Assembly (HUNTING COUNTER AREA)

1. Operation: Manual

- a. Operator: Push/Pull
- b. Curtain: Solid
- c. Locking System: Two-point
- d. Finish:
 - 1) Curtain: Clear Anodized.
 - 2) Bottom Bar, Hood and Tracks: Black.
 - 3) Other Components: Colored Anodized.

END OF SECTION 083457

SECTION 083830 - TRAFFIC DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Factory assembled full-height impact traffic doors units and frames.
2. Full height food service doors.
3. Door hardware.
4. Floor mounted limit post.

1.2 ACTION SUBMITTALS

- A. Shop Drawings:** Indicate dimensions, framed opening requirements and tolerances, and affected related work.
- B. Product Data:** Provide component dimensions, describe components within assembly, anchorage and fasteners, glass, door hardware and limit post.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.**

1.4 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, store and protect products in compliance with the requirements of Section 016000 and manufacturer's recommendations.**
- B. Product Delivery:** Deliver products to Site ready for installation. Establish a product delivery and installation date and establish a coordination procedure.
- C. Product Compliance Inspection:** Inspect delivered products for compliance with product descriptions in Part 2 herein. Report discrepancies to the Architect.
- D. Product Packaging:** Doors will be shipped in manufacturer's standard packaging with identification markings on each component or package.
- E. Store doors and accessories in unopened packages in protected dry area, to prevent damage from environmental and construction operations.**

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Impact Traffic Doors:

1. Chase Doors, Cincinnati, OH 45246 and Redmond, OR 97756, (800)-543-4455.

B. Food Service Doors:

1. Eliason Corporation, A Senneca Company, PO Box 2128, Kalamazoo, MI 49003, (800)-828-3655.

C. Substitutions: Not permitted.

2.2 IMPACT TRAFFIC DOORS

- A. Description: "Durulite Industrial Doors", Extra heavy duty, high impact traffic door, gasketed unless shown otherwise on Drawings.
- B. Door Panel: Solid high density polyethylene panels or non-CFC urethane-filled polyethylene plastic sandwich panels with textured surfaces on each face. Panels should be monolithic without add-on pieces or riveted assemblies. All exposed edges shall be bullnosed. Weight: 3.5 lbs. per square foot of door panel.
- C. Gaskets (Seals): Factory installed in integral keeper, nylon brush or rubber perimeter seal package.
- D. Hardware: V-Cam lift action gravity return hinges with full range of adjustments.
- E. Vision Panel: 1/8-inch polycarbonate with abrasion resistant surface. Panel to be factory installed and sealed in black aluminum frame. Size: 600 square inches per leaf and mounted a minimum of 40-inches from floor to bottom of vision panel. Reference Drawings for vision panel.
- F. Jamb Guards: Floor mounted.
- G. Bumpers: Full width, high impact resistant plastic with 4-inch projection, 18 inches high.
- H. Limit Post: LP/42 limiting post 42-inches tall, 5.25-inch diameter, color to match door, count (4) or as indicated on Drawings.
- I. Door Panel Color: Metallic Gray.

2.3 FOOD SERVICE DOORS

- A. Description: 3/4-inch exterior grade solid wood core; 1-inch total thickness; light to medium duty (Model SCP-12)
 1. Facing: Decorative plastic laminate.
 - a. Scuff Plates: 36 inches high black ABS.
 2. Window Size: 9 inches wide by 30 inches high.
 3. Window Flush: Flush window with black silk screen trim.
 4. Glazing: Clear acrylic.
 5. Laminate Finish: Black.
- B. Hardware and Accessories

1. Hinges: Double Action Easy Swing proprietary hinges.
 - a. Finish: Zinc coated.
- C. Food Service Doors provided by Contractor, installed by Others.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on Drawings. Beginning of installation means acceptance of existing conditions.
- B. Install doors in accordance with manufacturer's instructions.
- C. Attach to framing to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- D. Align doors level and plumb, free of warp or twist to provide smooth operation.
- E. Maintain dimensional tolerances and alignment with adjacent work.
- F. Install limiting post(s) to limit door swing to 90 degrees both directions.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors for smooth and balanced operation.
- B. Clean all surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping clothes. Take care to remove dirt from corners. Wipe surfaces clean.

END OF SECTION 083830

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SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing.
2. Storefront framing for punched openings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work.

1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
2. Certify compliance with the horizontal wind loads indicated on the structural drawings including the FM Global safety factor of 2.0.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

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

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

B. Special Warranty: Installer agrees to correct defective work within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on structural Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4-inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8-inch, whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
- E. Structural: Test according to ASTM E 330 as follows:
 - 1. When tested at positive and negative wind-load design pressures, assemblies do not have evidence of deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- H. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 25 as determined according to NFRC 500.
- I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

- A. Basis of Design Product: Kawneer product designations are used within this Section to identify aluminum framed storefront types and associated products unless noted otherwise.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Kawneer North America; an Alcoa company
 2. Oldcastle BuildingEnvelope™
 3. Tubelite Inc.
 4. No Substitutions.

2.3 FRAMING

- A. Interior Framing System Basis of Design: TRIFAB VersaGlaze 450, by Kawneer:
- B. Exterior Framing System Basis of Design: TRIFAB VersaGlaze 451T, by Kawneer.

- C. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Center.
 - 4. Finish: Black Anodic.
 - 5. Fabrication Method: Field-fabricated stick system.
- D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
- F. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 - 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 SAFETY CART RAIL

- A. System Basis of Design: Safety Rail 104060, by Kawneer:
- B. Members: Manufacturer's extruded- or formed-aluminum members of thickness required and reinforced as required to support imposed loads.
 - 1. Finish: Clear #14 Anodic Finish.
 - 2. Components:
 - a. Standoff Anchor Bar 060274 by Kawneer, reference plans for count
 - b. Standard End Cap 060275 by Kawneer.
 - 3. Fabrication Method: Field-fabricated.

2.5 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

2.6 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to the greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from interior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. Black Anodic Finish: AAMA 611, AA-M10C21A44, Class I, 0.7 mils or thicker.
 - 1. Application:
 - a. Exterior and Interior Entry.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41 AA-M10C21A41, Class I, 0.018 mm 0.7 mils or thicker.
 - 1. Application:
 - a. Safety Cart Rails at Cart Storage

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 088000 "Glazing."

3.2 FIELD QUALITY CONTROL

A. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

- a. Perform a minimum of two tests in areas as directed by Architect.

B. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 084113

SECTION 084229 - SLIDING AUTOMATIC CART DOOR (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes exterior, sliding, power-operated automatic cart door.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For automatic cart door entrance.
 - 1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.
 - 3. Indicate locations of activation and safety devices.
 - 4. Include hardware schedule and indicate hardware types, functions, quantities, and locations.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Manufacturer's warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative, with certificate issued by AAADM, who is trained and approved for installation and maintenance of units required for this Project.

1.5 WARRANTY

- A. Warranty: Manufacturer agrees to repair or replace components of automatic cart doors that fail in materials and/or workmanship within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.
 - 2. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and the completed inspection form shall be submitted to the Owner.
 - 3. During the warranty period, all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PART 2 - PRODUCTS

2.1 AUTOMATIC CART DOOR ASSEMBLIES

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Power-Operated Door Standard: BHMA A156.10.

2.2 PERFORMANCE REQUIREMENTS FOR AUTOMATIC CART DOORS

- A. Design system to operate, hold open, and close doors under wind and suction loads calculated by the manufacturer based on the design wind loads shown on the Structural Drawings but not less than a wind load pressure of 20 PSF.
- B. Provide for dimensional distortion of components during operation.
- C. Provide for opening and closing operation of door panels in the event of power failure.
- D. Operating Temperature Range: -30 F to 130 F ambient.
- E. Eliminate system performance interference by ambient light and radio frequencies.

2.3 REGULATORY REQUIREMENTS FOR AUTOMATIC SLIDING CART DOORS

- A. Conform to applicable code for automatic release of control drive unit to permit manual opening of doors.
- B. State or Local requirements (where applicable).
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

2.4 SLIDING AUTOMATIC CART DOORS

- A. General: Provide manufacturer's standard automatic entrances including doors, framing, headers, carrier assemblies, roller tracks, door operators, controls, and accessories required for a complete installation.
- B. Sliding Automatic Cart Doors:
 - 1. Single-Sliding Units:
 - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) Stanley Access Technologies, LLC., Contact: Ryan Driscoll
Ryan.Driscoll@sbdinc.com, (860) 679-6431.
 - a) Exterior Doors: Cart Door.

- 2) Substitutions: Not permitted.
2. Configuration Two Single -sliding door(s) with sidelite(s).
 - a. Traffic Pattern: Two way.
 - b. Mounting: Between jambs.
3. Operator Features:
 - a. Power opening and closing.
 - b. Drive System: belt.
 - c. Adjustable opening and closing speeds.
 - d. Adjustable hold-open time between zero and 30 seconds.
 - e. Obstruction recycle.
 - f. On-off/hold-open switch to control electric power to operator.
 - g. Adjustable braking.
 - h. Adjustable back-checking and latching.
 - i. Energy conservation switch that reduces door-opening width.
 - j. Closed loop speed control with active braking and acceleration.
 - k. Variable obstruction recycle time delay.
 - l. Self-adjusting stop position.
 - m. Self-adjusting closing compression force.
4. Sliding-Door Carrier Assemblies and Overhead Roller Tracks: Carrier assembly that allows vertical adjustment; consisting of nylon- or Delrin®-covered, ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or Delrin®-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.
 - a. Rollers: Minimum of two ball-bearing roller wheels and two anti-rise rollers for each active leaf.
5. Sliding-Door Threshold: Threshold members and bottom-guide-track system with stainless-steel, ball-bearing-center roller wheels.
 - a. Configuration Exterior Door System: Continuous Standard extrusion double square. Threshold to extend across door opening.
6. Controls: Activation and safety devices according to BHMA standards.
 - a. Activation Device: Keyed switch mounted on exterior side of door to activate door operator.
 - b. Safety Device: Four combined photoelectric beams mounted in sidelite jambs on one side of the door to detect pedestrians in the presence zone and to prevent door from closing.
7. Finish: Finish framing, door(s), and header.
 - a. 204-R1, Clear
 - b. Class I, two-step hard coat black.
 - c. Other anodized or painted finish as specified.

2.5 ENTRANCE COMPONENTS

- A. Framing Members: Extruded aluminum, minimum 0.125-inch thick and reinforced as required to support imposed loads.
 - 1. Nominal Size: 1-3/4-inch by 4-1/2-inch
 - 2. Extruded Glazing Stops and Applied Trim: Minimum 0.062-inch wall thickness.
- B. Stile and Rail Doors: 1-3/4-inch-thick, glazed doors with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded or incorporate concealed tie-rods that span full length of top and bottom rails.
 - 1. Glazing Stops and Gaskets: Snap-on, extruded-aluminum stops and preformed gaskets.
 - 2. Stile Design: Medium stile, 2-inch nominal width.
 - 3. Rail Design: 4-inch nominal height.
 - 4. Muntin Bars: Horizontal tubular rail member for each door; match stile design and finish.
- C. Headers: Fabricated from minimum 0.125-inch-thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
 - 1. Mounting: Concealed, aligned with framing as indicated on drawings.

2.6 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extrusions: ASTM B 221.
 - 2. Sheet: ASTM B 209.
- B. Steel Reinforcement: Reinforcement with corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Use surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
- C. Glazing: As specified in Section 088000 "Glazing."
- D. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."
- E. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, non-staining grout; complying with ASTM C 1107/C 1107M; of consistency suitable for application.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

- G. Fasteners and Accessories: Corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.7 DOOR OPERATORS AND CONTROLS

- A. General: Provide operators and controls, which include activation and safety devices, according to BHMA standards, for condition of exposure, and for long-term, maintenance-free operation under normal traffic load for type of use indicated.
- B. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement.
 - 1. Door Operator Performance: Door operators shall open and close doors and maintain them in a fully closed position when subjected to Project's design wind loads.
 - 2. Electromechanical Operators: Concealed, self-contained, overhead unit powered by fractional-horsepower, permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor; with solid-state microprocessor controller; UL 325; and with manual operation with power off.
- C. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection-field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.
- D. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.
- E. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.8 HARDWARE

- A. General: Provide units in sizes and types recommended by automatic cart door and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish.
- B. Deadlocks: Deadbolt operated by exterior cylinder and interior thumb turn, with minimum 1-inch-long throw bolt; BHMA A156.5, Grade 1.
 - 1. Cylinders: BHMA A156.5, Grade 1, six-pin mortise type.
 - a. Keying: Falcon keyed cylinder by others.
 - 2. Deadbolts: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.
 - 3. Two-Point Locking for Stile and Rail Sliding Doors: Mechanism in stile of active door leaf that automatically extends second lockbolt into overhead carrier assembly.

C. Weather Stripping: Replaceable components.

1. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.9 FABRICATION

A. General: Factory fabricate automatic cart door components to designs, sizes, and thicknesses indicated on drawings and to comply with indicated standards.

B. Framing: Provide automatic cart door framing as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.

1. Provide components with concealed fasteners and anchor and connection devices.
2. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
3. Fabricate exterior components to drain condensation and water passing joints within system to the exterior.
4. Provide anchorage and alignment brackets for concealed support of assembly from building structure.
5. Allow for thermal expansion of exterior units.

C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.

D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.

E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."

F. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.

1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors sidelites.

G. Controls:

1. General: Factory install activation and safety devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.

2.10 ALUMINUM FINISHES

A. Black Anodized Aluminum Finish: AAMA 611, AA-M10C22A44, Class I, 0.07-mm or thicker.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect frame opening for correct size, plumb and square and level floor for safe and reliable performance.
- B. Provide written notification to the appropriate personnel of conditions not acceptable to the installer and/or manufacturer.
- C. Proceed with installation only after necessary corrections are made by the general contractor to insure a suitable opening.

3.2 INSTALLATION

- A. General: Install automatic cart doors according to manufacturer's written instructions and cited BHMA standard for direction of cart loading, including signage, controls, wiring, and connection to the building's power supply.
 - 1. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
 - 2. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 3. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous coating.
- B. Cart Door Entrance: Install automatic cart doors plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
 - 1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - 2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
 - 3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
 - 4. Level recesses for recessed thresholds using non-shrink grout.
- C. Door Operators: Connect door operators to electrical power distribution system.
- D. Controls: Install and adjust activation and safety devices according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- E. Glazing: Install glazing as specified in Section 088000 "Glazing."
- F. Sealants: Comply with requirements specified in Section 079200 "Joint Sealants" to provide weathertight installation.

1. Set thresholds, bottom-guide-track system, framing members and flashings in full sealant bed.
2. Seal perimeter of framing members with sealant.

G. Signage: Apply signage on the interior side of door indicating that door is not an exit.

H. Wiring within Automatic Cart Door Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test and inspect each automatic entrance, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.

B. Automatic cart doors will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust hardware, moving parts, door operators, and controls to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.

B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal use (100 to 300 cycles).

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic cart doors.

END OF SECTION 084229

SECTION 084229.23 – IMPACT RATED SLIDING AUTOMATIC ENTRANCES (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes exterior and interior, single slide and bi-parting, impact rated, power-operated sliding automatic entrances.

1.2 PERFORMANCE REQUIREMENTS

- A. Design system to operate, hold open, and close doors under wind and suction loads calculated by the manufacturer based on the design wind loads shown on the Structural Drawings and the following requirements:
 - 1. General: Provide automatic entrance door assemblies capable of withstanding loads and thermal movements based on testing of manufacturer's standard units in assemblies similar to those indicated for this project.
 - 2. Operating Range: Minus 30 deg F (Minus 34 deg C) to 130 deg F (54 deg C).
 - 3. Opening-Force Requirements for Egress Doors: Not more than 50lbf (222 N) required to manually set door in motion in the direction of egress if power fails, and not more than 15 lbf (67 N) required to open door to minimum required width.
 - 4. Closing-Force Requirements: Not more than 30 lbf (133 N) required to prevent door from closing.
 - 5. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 1.25 cfm/sf. (6.4 L/s-m²) of fixed entrance system area when tested according to ASTM E 283 at a minimum static air pressure difference of 6.24 lbf/sf (299 Pa).
 - 6. Wind Pressure and Impact Ratings: Wind Pressure and impact rated sliding automatic entrance systems shall be designed to comply with the following:
 - a. Design Pressures: Designed to withstand up to 75 psf (3591 Pa), wind force in both the positive and negative direction, and as indicated on the structural drawings for both wind speed and wind pressure.
 - b. Missile Impact: Large and small missile impact rated in accordance with Florida Building Code and other applicable building code requirements.
 - 7. Tropical-cyclone resistant construction
 - a. Tropical-cyclone resistant construction is required for all locations with a design wind speed of 100 mph (ASCE 7-05) or greater per FM Global Data Sheet 1-28.
 - 1) This includes but is not limited to doors, windows, skylights, loading dock doors and louvers.
 - 2) Refer to FM Global Data Sheet 1-28 for design requirements.
 - b. Forward the following information to FM Global for review:

- 1) Cut sheets and product information for all exterior openings (Doors, windows, skylights, overhead coiling doors, louvers, etc.) indicating their ASTM design standards, tropical-cyclone resistant construction, and missile impact resistance.
- B. Provide for dimensional distortion of components during operation.
 - C. Eliminate system performance interference by ambient light and radio frequencies.
- 1.3 ACTION SUBMITTALS
- A. Product Data: For each type of product.
 - B. Related Sections:
 1. Section 088000 – Glazing for glazing materials and installation requirements for glazing for automatic entrances.
 - C. References:
 1. Florida Building Code, currently adopted version.
 2. Florida Administrative Code (FAC).
 3. Miami-Dade County Building Code Compliance Office:
 - a. Product Control Division, Notice of Acceptance.
 4. FM Global Property Loss Prevention Data Sheet 1-28 Wind Design.
 5. International Building Code – current version as adopted by the state and local authority having jurisdiction.
 - D. Shop Drawings:
 1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
 2. Include diagrams for power, signal, and control wiring.
 3. Indicate locations of activation and safety devices.
 4. Include hardware schedule and indicate hardware types, functions, quantities, and locations.
 - E. Design Certifications:
 1. Product Control Division, Notice of Acceptance from Miami-Dade County Building Code Compliance Office.
 2. Product Approval in accordance with FAC 9N-3.
- 1.4 CLOSEOUT SUBMITTALS
- A. Operation and maintenance data.
 - B. Manufacturer's warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative, with certificate issued by AAADM, who is trained and approved for installation and maintenance of units required for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer with a manufacturing facility certified under ISO 9001.
- C. Certifications: Automatic sliding door systems shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards:
 - 1. ANSI / BHMA A 156.10.
 - 2. NFPA 101.
 - 3. UL 325 listed.
 - 4. State and/or local building codes as applicable for project site.
- D. Emergency Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress. Provide for opening and closing operation of door(s) in the event of power failure.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 WARRANTY

- A. Warranty: Manufacturer agrees to repair or replace components of automatic cart doors that fail in materials and/or workmanship within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.
 - 2. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and the completed inspection form shall be submitted to the Owner.
 - 3. During the warranty period, all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PART 2 - PRODUCTS

2.1 AUTOMATIC ENTRANCES

- A. Manufacturer: Stanley Access Technologies: Dura-Storm 2000 & 3000 Series sliding automatic entrances as applicable for project configuration.
 - 1. Stanley Access Technologies, LLC., Contact: Ryan Driscoll; Ryan.Driscoll@sbdinc.com; (860) 679-6431.
 - 2. Substitutions not permitted.

2.2 AUTOMATIC ENTRANCE DOOR ASSEMBLIES, INCLUDING CART DOORS

- A. General: Provide manufacturer's standard automatic entrances doors assemblies, including doors, sidelights, framing, headers, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for a complete installation.
- B. Sliding Automatic Entrances:
 - 1. Configuration: As indicated on the drawings.
 - 2. Traffic Pattern: Two-way.
 - 3. Emergency Breakaway Capability: Sliding leaves and sidelights, as indicated on the drawings.
 - 4. Mounting: Between jambs.

2.3 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Headers, stiles, rails, and frames: 6063-T6.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Sheet and Plate: ASTM B 209.
- B. Steel Reinforcement: Reinforcement with corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Use surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
- C. Glazing: As specified in Section 088000 "Glazing."
- D. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."
- E. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, non-staining grout; complying with ASTM C 1107/C 1107M; of consistency suitable for application.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Fasteners and Accessories: Corrosion-resistant, non-staining, nonbleeding fasteners, and accessories compatible with adjacent materials.

2.4 COMPONENTS

- A. Framing Members: Manufacturer's standard extruded aluminum, reinforced as required to support imposed loads.

1. Nominal Size: 1-3/4-inch by 4-1/2-inch.
 2. Concealed Fastening: Framing shall incorporate a concealed fastening pocket, and continuous flush insert cover, extending full length of each framing member.
- B. Stile and Rail Doors and Sidelights: Manufacturer's standard 1-3/4-inch-thick, glazed doors with extruded-aluminum tubular stile and rail members. Incorporate concealed tie-rods that span full length of top and bottom rails. All corners, including intersections of stiles and rails, or stiles and muntin bars, shall be welded securely.
1. Glazing Stops and Gaskets: Snap-on, extruded-security aluminum inboard stops with preformed glazing gaskets with approved structural silicone.
 2. Mechanically fastened outboard gutter stop with approved structural glazing tape.
 3. Stile Design: Medium stile, 3-1/2-inch nominal width.
 4. Rail Design: 4-inch nominal height.
 5. Muntin Bars: Horizontal tubular rail member for each door; 4-1/4-inch nominal width; match stile design and finish.
- C. Glazing: Performed under Section 088000 – Glazing in accordance with product approvals and the following:
1. Glass: 5/8-inch (16mm) laminated impact rated glass as specified in product approvals.
 2. Glazing: Outboard stop with approved structural tape.
- D. Headers: Fabricated from extruded aluminum and extending full width of automatic entrance door units to conceal door operators, carrier assemblies, and roller tracks. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
1. Mounting: Concealed, aligned with framing as indicated on drawings.
 2. Capacity: Capable of supporting up to 220 lb (100 kg) per panel, up to four panels, over spans up to 14-feet (4.3 m) without intermediate supports.
- E. Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment of at least 1/8-inch (3 mm); consisting of urethane with precision steel lubricated ball-bearing wheels, operating on a continuous roller track. Support panels from carrier assembly by load wheels and anti-riser wheels with factory adjusted cantilever and pivot assembly. Minimum two ball-bearing load wheels and two anti-riser rollers for each active leaf. Minimum load wheel diameter shall be 2-1/2-inch (64 mm); minimum anti-rise roller diameter shall be 2-inch (51 mm).
- F. Thresholds: Manufacturer's standard thresholds with bottom guide track system, as indicated below:
1. Recessed entry mat installations: continuous standard square extrusion and as indicated on the drawings.
 2. Level entry mat installations: Continuous tapered extrusion with bevels to exterior and sales floor sides and square extrusion edges on sides where adjacent to entry mats. Refer to drawings for additional information.
 3. All thresholds to conform to details and requirements for code compliance.

4. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
 - a. For site locations within 1-mile proximity to the coast, all fasteners with exterior exposure to be type 316 stainless steel for corrosion resistance.
5. Signage: Provide signage in accordance with ANSI/BHMA A156.10.

2.5 DOOR OPERATORS

- A. General: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term operation under normal traffic load for type of occupancy indicated.
- B. Electromechanical Operators: Self-contained overhead unit powered by a minimum of 1/4 horsepower, permanent-magnet DC motor with gear reduction drive, microprocessor controller; and encoder.
 1. Operation: Power opening and power closing.
 2. Features:
 - a. Adjustable opening and closing speeds.
 - b. Adjustable open check and close check speeds.
 - c. Adjustable hold-open time between 0 and 30 seconds.
 - d. Obstruction recycle.
 - e. On/Off switch to control electric power operator.
 - f. Energy conservation switch that reduces door-opening width.
 - g. Closed loop speed control with active braking and acceleration.
 - h. Adjustable obstruction recycle time delay.
 - i. Self-adjusting stop position.
 - j. Self-adjusting closing compression force.
 - k. Onboard sensor power supply.
 - l. Onboard sensor monitoring.
 - m. Optional Switch to open/Switch to close operation.
 - n. Fire alarm interface, configurable to safely open or close the entrance on signal from fire alarm system.
 3. Mounting: Concealed.
 4. Drive System: Synchronous belt type.
- C. Electrical service to door operators shall be provided under Division 26 Electrical. Minimum service to be 120 VAC, 5 amps.

2.6 ELECTRICAL CONTROLS

- A. Electrical Control System: Electrical control system shall include a microprocessor controller and a high-resolution position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position and speed.

1. The high-resolution encoder shall have a resolution of not less than 1024 counts per revolution. Systems utilizing external magnets and magnetic switches are not acceptable.
 2. The electrical control system shall include a 24 VDC auxiliary output rated at 1 amp.
- B. Performance Data: the microprocessor shall collect; store performance data as follows:
1. Counter: A non-resettable counter to track operating cycles.
 2. Event Reporting: Unit shall include non-volatile event and error recording including number of occurrences of events and errors, and cycle count of most recent events and errors.
 3. LED Display: Display presenting the current operating state of the controller.
- C. Controller Protection: the microprocessor controller shall incorporate the following features to ensure trouble free operation:
1. Automatic Reset Upon Power Up.
 2. Main Fuse Protection.
 3. Electronic Surge Protection.
 4. Internal Power Supply Protection.
 5. Resettable sensor supply fuse protection.
 6. Motor Protection, over-current protection.
- D. Soft Start/Stop: A “soft-start” “soft-stop” motor driving circuit shall be provided for smooth normal opening and recycling.
- E. Obstruction Recycle: Provide system to recycle the sliding panels when an obstruction is encountered during the closing cycle. If an obstruction is detected, the system shall search for that object on the next closing cycle by reducing door closing speed prior to the previously encountered obstruction location and will continue to close in check speed until doors are fully closed, at which time the doors will reset to normal speed. If obstruction is encountered again, the door will come to a full stop. The doors shall remain stopped until obstruction is removed and operate signal is given, resetting the door to normal operation.
- F. Programmable Controller: Microprocessor controller shall be field programmable.
1. The following parameters may be adjusted:
 - a. Operating speeds and forces as required to meet specified ANSI/BHMA standard.
 - b. Adjustable and variable features specified.
 - c. Reduced opening position.
 2. Manual programming shall be available through a local interface which has a two-digit display with a selection control including three push buttons.
- G. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection-field sizes and functions required by BHMA A156.10. Sensors shall always remain active.

- H. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.
- I. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.7 ACTIVATION AND SAFETY DEVICES

- A. Combined Activation and Safety Sensors: Combined activation and safety sensors shall, in a single housing, detect motion and presence in accordance with ANSI/BHMA A156.10. Motion shall be detected using K-band microwave technology, presence by active infrared reflection technology.
 - 1. Mounting Height: Up to 11.5-feet (3.5 m) above finish floor.
 - 2. Temperature Range: Between -31 degrees F and 131 degrees F (35 degrees C and 55 degrees C) in all environmental conditions.
 - 3. Relays: Form C, 50V at 0.3A for both activation and safety. Hold time of less than 0.5 seconds.
 - 4. Detection Pattern: When detection is made in the activation zone, and the entrance opens, the safety zone shall extend through the threshold on each side; creating an X-pattern. When activation and safety zones are cleared, and the entrance closes the sensor will ignore the X-pattern safety zones.
 - 5. Combined motion and presence sensors shall be equal to or better than the manufacturer's recommended devices.
- B. Photoelectric Beams: In addition to the threshold sensor, include a minimum of two (2) doorway holding beams. Photoelectric beams shall be pulsed infrared type, including sender receiver assemblies for recessed mounting.
- C. Presence Sensor Monitoring: Sliding automatic entrances control system shall include a means to verify the functionality of all active presence sensors in accordance with ANSI/BHMA A156.10. A detected fault shall cause automatic operation to cease until the fault is corrected.

2.8 HARDWARE

- A. General: Provide units in sizes and types recommended by automatic entrance door and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish.
- B. Emergency Breakaway Feature: Provide release hardware that allows panel(s) to swing out in direction of egress to full 90 degrees from any position in sliding mode. The maximum force to open panel shall be 50 lbf (222 N) according to ANSI/BHMA A156.10. Interrupt powered operation of panel operator while in breakaway mode.
 - 1. Emergency Breakaway feature shall include at least two adjustable detent devices mounted in each breakaway panel; one top mounted and one bottom mounted, to control panel breakaway force.

2. Wind Resistant Damper: Provide factory installed concealed gas dampers in sliding or non-sliding breakaway panels to protect door panels from wind damage. Dampers shall be designed to slow panel movement after breakout.
- C. Locking: Manufacturer's approved multi-point locking system as follows:
1. Hook bolt: Laminated-steel hook, mortise type, operated by exterior cylinder and interior thumb turn; with a minimum 1-inch (25 mm) long throw bolt; ANSI/BHMA A156.5, Grade 1.
 2. Five-Point Locking: Provide locking components within sliding panels, operated by exterior cylinders and interior thumb turns, that extend flush bolts into overhead carrier assemblies and threshold on engagement of hood bolt lock and related cylinder.
 3. Cylinders: As specified in Section 087111 – Door Hardware.
 4. Lock/Unlock Indicators: Provide lock position indicators integrated with locking system. Indicators shall be stile mounted on the secure side of the door and provide a visual display of lock position for; "OPEN" in black letters when unlocked, "LOCKED" in red letters when locked.
 5. Armored Strike: Provide reinforced security strike plate on bi-parting entrances.
- D. Control Switch: Provide manufacturer's standard rotary switch mounted on the interior jamb and door position switch to allow for full control of the automatic entrance door. Controls to include, but not limited to:
1. One-way traffic.
 2. Reduced Opening.
 3. Open/Closed/Automatic.
- E. Power Switch: Sliding automatic entrances shall be equipped with a two position On/Off rocker switch to control power to the door.
- F. Weather Stripping: Manufacturer's standard replaceable components.
1. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
 - a. Provide double pile weather stripping on lead stiles of sliding panels and stiles adjacent to jambs.
 - b. Provide single pile weather stripping between carrier and header, lead stiles of sidelights, and on pivot stiles of sliding panels.
- G. Weather Sweeps: Adjustable, dual brush, nylon brush sweep mounted to underside of door bottom.

2.9 FABRICATION

- A. General: Factory fabricate the automatic door assembly components to designs, sizes, and thicknesses indicated on drawings and to comply with indicated standards.
1. Form aluminum shapes before finishing.
 2. Use concealed fasteners to the greatest extent possible.

- a. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - b. Reinforce members as required to receive fastener threads.
- B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
 - 1. Fabricate tubular and channel frame assemblies with manufacturer's standard mechanical or welded joints. Provide sub-frames and reinforcement as required for a complete system to support required loads.
 - 2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
 - 3. Form profiles that are sharp, straight, and free of defects or deformations.
 - 4. Prepare components to receive concealed fasteners and anchor and connection devices.
 - 5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
 - 6. Fabricate exterior components to drain condensation and water passing joints within system to the exterior.
 - 7. Provide anchorage and alignment brackets for concealed support of assembly from building structure.
 - 8. Allow for thermal expansion of exterior units.
- C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
- D. Door Operators: Factory fabricated and installed in the headers, including adjusting and testing.
- E. Welding: Comply with AWS A5.10/A5.10M – Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.
- F. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."
- G. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.
 - 1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors, sidelites.
- H. Controls:
 - 1. General: Factory install activation and safety devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.

2.10 ALUMINUM FINISHES

- A. Black Anodized Aluminum Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.70 mills minimum or thicker, complying with AAMA 611-98, and AAMA 606.1.
 - 1. For project site locations within 1 mile of a seacoast, provide manufacturer's standard, clear, protective, anti-corrosion coating over the black anodized finish.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect frame opening for correct size, header support, plumb and square and level floor for safe and reliable performance.
- B. Provide written notification to the appropriate personnel of conditions not acceptable to the installer and/or manufacturer.
- C. Proceed with installation only after necessary corrections are made by the general contractor to insure a suitable opening.

3.2 INSTALLATION

- A. General: Install automatic entrances according to manufacturer's written instructions and cited BHMA standard for direction of door panel movement, including signage, controls, wiring, and connection to the building's power supply. Anchor securely in place.
 - 1. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
 - 2. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 3. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous coating.
- B. Door Operators: Connect door operators to electrical power distribution system.
- C. Controls: Install and adjust activation and safety devices according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- D. Glazing: Install glazing as specified in Section 088000 "Glazing," and in accordance with sliding automatic entrance manufacturer's instructions.
- E. Sealants: Comply with requirements specified in Section 079200 "Joint Sealants" to provide weathertight installation.
 - 1. Set thresholds, bottom-guide-track system, framing members and flashings in full sealant bed.
 - 2. Seal perimeter of framing members with sealant.

- F. Signage: Apply signage on the interior side of cart doors indicating that door is not an exit.
- G. Wiring within Automatic Cart Door Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-trained installer:
 - 1. Test and inspect each automatic entrance, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.
- B. Automatic entrance and cart doors will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust hardware, moving parts, door operators, and controls to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
- B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal use (100 to 300 cycles).
- C. Clean glass and aluminum surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic entrance doors.

END OF SECTION 084229

SECTION 084600 - SWINGING AUTOMATIC ENTRANCES (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes exterior and interior, swinging, power-operated automatic entrances.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For automatic entrances.
 - 1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.
 - 3. Indicate locations of activation and safety devices.
 - 4. Include hardware schedule and indicate hardware types, functions, quantities, and locations.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Manufacturer's warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative, with certificate issued by AAADM, who is trained and approved for installation and maintenance of units required for this Project.

1.5 WARRANTY

- A. Warranty: Manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.
 - 2. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and the completed inspection form shall be submitted to the Owner.
 - 3. During the warranty period, all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PART 2 - PRODUCTS

2.1 AUTOMATIC ENTRANCE ASSEMBLIES

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Power-Operated Door Standard: BHMA A156.10.

2.2 PERFORMANCE REQUIREMENTS FOR AUTOMATIC SLIDING ENTRANCE DOORS

- A. Design system to operate, hold open, and close doors under wind and suction loads calculated by the manufacturer based on the design wind loads shown on the Structural Drawings but not less than a wind load pressure of 20 PSF.
- B. Provide for dimensional distortion of components during operation.
- C. Provide for opening and closing operation of door panels in the event of power failure.
- D. Operating Temperature Range: -30 F to 130 F ambient.
- E. Eliminate system performance interference by ambient light and radio frequencies.
- F. Provide sliding doors and side panels with break-away capability where scheduled or shown.

2.3 REGULATORY REQUIREMENTS FOR AUTOMATIC SWINGING ENTRANCE DOORS

- A. Conform to applicable code for automatic release of control drive unit to permit manual opening of doors.
- B. State or Local requirements (where applicable).
- C. Comply with ANSI A156.10 and ANSI A117.1.
- D. ADA (Americans with Disabilities) requirements for entrance door access, entrance doors and hardware.
- E. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

2.4 SWINGING AUTOMATIC ENTRANCES

- A. General: Provide manufacturer's standard automatic entrances including doors, sidelites, framing, headers, carrier assemblies, door operators, controls, and accessories required for a complete installation.
- B. Sliding Automatic Entrance:
 - 1. Swinging Units:

- a. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) Stanley Access Technologies, LLC Contact: Ryan Driscoll
Ryan.Driscoll@sbdinc.com, (860) 679-6431.
 - a) Interior Doors: Stanley Magic-Force with Swing-Guard
 - b) Exterior Doors: Stanley Magic-Force with Swing-Guard
 - 2) Substitutions: Not permitted.
2. Configuration: Swinging door(s) with sidelite(s).
 - a. Traffic Pattern: One way.
 - b. Emergency Breakaway Capability: Swinging leaves.
 - c. Mounting: Between jambs.
3. Design Features:
 - a. Opening time to 80 degrees shall not be less than 1-1/2 seconds as required by ANSI A.156.10.
 - b. Force to prevent a stopped door from opening in the last 10 degrees of opening, or at any point in closing shall not exceed 40 lbs.
 - c. Back check speed.
 - d. Hold Open: The door shall be field adjusted to remain fully open for not less than 5 seconds.
 - e. Door closing shall be by spring force and monitored by the microprocessor control, capable of providing limited power assist to insure the door closes.
 - f. Closing speed: Doors shall be field adjusted to close from 90 degrees to 10 degrees in 2 seconds or longer as required in Table 10.2.5 of ANSI A156.10, dependent upon final door weight.
 - g. Doors shall close from 10 degrees to fully closed in not less than 1.5 seconds
 - h. Door will safely stop and hold from 5 seconds if an object is encountered in the opening cycle. At the end of the 5 seconds, if the actuating signal and time delay have expired, the unit will close. If the actuate signal or time delay is still present, the unit shall resume opening at a reduced speed.
 - i. Field selectable delayed activation to provide an adjustable delay between receipt of the activation signal and actual opening of the door.
 - j. Built-in dry contacts to control automatic locking and electrified exit hardware.
 - k. Logic terminal for interface with accessories and sensors.
 - l. Microprocessor control shall retain the history of last 10 alarm/error events.
4. Display Board. Unit will provide the ability to determine diagnostic evaluation of problematic issues through a digitized panel. When provided, the display will provide confirmation that the door is performed properly and also provide error codes when it is not. This same panel shall also provide systematic information such as counters for usage determination and provide the installing contractor's telephone number in the event of service requirements.
5. Door Operators – Construction: The door operating equipment must use the electromechanical 8000 series drive system.

- a. Unit must be non-handed, and able to operate as an in-swing or out-swing unit by field selection in the microprocessor control.
 - b. The unit must be factory assembled, adjusted and tested.
 - c. Gear box operator: Self-contained cast aluminum housing, with precision-machined gears and bearing seals and all-weather lubricant, and not require vibration isolators. No exposed gears. The gear box shall use an adjustable compression spring engineered for maximum life. No electro hydraulic equipment shall be allowed.
 - d. Motor: DC permanent magnet motor with shielded ball bearings. Motor will stop when the door stops or is fully open and when breakaway is operated.
 - e. Door operating arm: Forged and machined steel and shall be either direct drive or isolated pivot with slide track in top of door.
6. Swinging-Door Threshold: Threshold to be stainless-steel members.
- a. Configuration Exterior Door System: Standard tapered extrusion square by square equal to the thickness of the door. Threshold to be at pivot point only, threshold not to extend under swinging door.
 - b. Configuration Interior Door System: Standard tapered extrusion square by square equal to the thickness of the door. Threshold to be at pivot point only, threshold not to extend under swinging door.
7. Enclosure: Operator shall be completely self-contained within as extruded aluminum header (alloy 6063-T6) with removable access cover with an overall size of 5-1/2" deep x 6" high. Header and cover shall be integral color anodized to match adjacent storefront/frame finish.
8. Controls: Activation and safety devices according to BHMA standards.
- a. Activation Device: BEA Eagle Activation Sensor – Provide an automatic entrance door sensor capable of providing motion detection activation via microwave (motion detection) K-band (24.125GHz) technology. Motion sensor mounted on door header to detect pedestrians in activating zone to activate door operator.
 - b. Safety Device: BEA LZR-microscan -The door mounted presence sensor system shall detect stationary humans or equivalent within the sensing pattern. The sensor shall utilize distance-measuring time of flight technology and have a self-adapting pattern that is background independent. The system shall require no learn time due to changes in background reflectivity.
9. Finish: Finish framing, door(s), and header
- a. 204-R1, Clear
 - b. Class I, two-step hard coat black.
 - c. Other anodized or painted finish as specified.
10. Guide Rails:
- a. Provide appropriate size guide rails as needed to comply with ANSI 156.10

2.5 ENTRANCE COMPONENTS

- A. Framing Members: Extruded aluminum, minimum 0.125-inch-thick and reinforced as required to support imposed loads.
 - 1. Nominal Size: 1-3/4-inches by 4-1/2-inches.
 - 2. Extruded Glazing Stops and Applied Trim: Minimum 0.062-inch wall thickness.
- B. Stile and Rail Doors: 1-3/4-inch-thick, glazed doors with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded or incorporate concealed tie-rods that span full length of top and bottom rails.
 - 1. Glazing Stops and Gaskets: Snap-on, extruded-aluminum stops and preformed gaskets.
 - 2. Stile Design: Medium stile, 2-inch nominal width.
 - 3. Rail Design: 4-inch nominal height.
 - 4. Muntin Bars: Horizontal tubular rail member for each door; match stile design and finish.
- C. Sidelite(s): 1-3/4-inch-deep sidelite(s) with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members matching door design.
 - 1. Glazing Stops and Gaskets: Same materials and design as for stile and rail door.
 - 2. Muntin Bars: Horizontal tubular rail members for each sidelite; match stile design.
- D. Headers: Fabricated from minimum 0.125-inch-thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
 - 1. Mounting: Concealed, align header as indicated on drawings.

2.6 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extrusions: ASTM B 221.
 - 2. Sheet: ASTM B 209.
 - 3. Finish: Finish framing, door(s), and header
 - a. 204-R1, Clear
 - b. Class I, two-step hard coat black.
 - c. Other anodized or painted finish as specified.
- B. Steel Reinforcement: Reinforcement with corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Use surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

- C. Glazing: As specified in Section 088000 "Glazing."
- D. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."
- E. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, non-staining grout; complying with ASTM C 1107/C 1107M; of consistency suitable for application.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Fasteners and Accessories: Corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.7 MATERIALS

- A. Deadlocks: Deadbolt operated by exterior cylinder and interior thumb turn, with minimum 1-inch-long throw bolt; BHMA A156.5, Grade 1.
 - 1. Cylinders: BHMA A156.5, Grade 1, six-pin mortise type.
 - a. Keying: Falcon keyed cylinder by others.
 - 2. Deadbolts: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.
- B. Weather Stripping: Replaceable components.
 - 1. Continuous adjustable: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.8 FABRICATION

- A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.
- B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
 - 1. Provide components with concealed fasteners and anchor and connection devices.
 - 2. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
 - 3. Fabricate exterior components to drain condensation and water passing joints within system to the exterior.
 - 4. Provide anchorage and alignment brackets for concealed support of assembly from building structure.
 - 5. Allow for thermal expansion of exterior units.
- C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.

- D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.
- E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."
- F. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.
 - 1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors and breakaway sidelites.
- G. Controls:
 - 1. General: Factory install activation and safety devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.

2.9 ALUMINUM FINISHES

- A. Black Anodized Aluminum Finish: AAMA 611, AA-M10C22A44, Class I, 0.07-mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install automatic entrances according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel, including signage, controls, wiring, and connection to the building's power supply.
 - 1. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
 - 2. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 3. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous coating.
- B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
 - 1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - 2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
 - 3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
 - 4. Level recesses for recessed thresholds using non-shrink grout.

- C. Door Operators: Connect door operators to electrical power distribution system.
- D. Controls: Install and adjust activation and safety devices according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- E. Glazing: Install glazing as specified in Section 088000 "Glazing."
- F. Sealants: Comply with requirements specified in Section 079200 "Joint Sealants" to provide weathertight installation.
 - 1. Set thresholds, bottom-guide-track system, framing members and flashings in full sealant bed.
 - 2. Seal perimeter of framing members with sealant.
- G. Signage: Apply signage on both sides of each door and breakaway sidelite as required by cited BHMA standard for direction of pedestrian travel.
- H. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Test and inspect each automatic entrance, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.
- B. Automatic entrances will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.3 ADJUSTING

- A. Adjust hardware, moving parts, door operators, and controls to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
- B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION 084229

**SECTION 086200 - UNIT SKYLIGHTS
(PROVIDED AND INSTALLED BY ACADEMY'S CONTRACTOR)**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preformed plastic skylights with integral metal frame and insulated metal curb.
2. Skylights are to be fabricated in strict compliance with this specification.

1.2 REFERENCE

- A. FM 4431 including 2-inch severe hail test.
- B. ASTM B 209 - standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.
- C. Aluminum Association (AA): Specifications for Aluminum Structures.
- D. North American Fenestration Standard /WDMA/CSA 101/I.S.2/A440 (NAFS). Standard skylight testing for air, water, and structural performance.
- E. NFRC 102: U-Factor: Test procedure for measuring the steady-state thermal transmittance of fenestration systems.
- F. NFRC 201: Solar Heat Gain Coefficient: Test procedure for measuring the solar heat transfer through fenestration systems.
- G. Miami Dade – Florida Building Code and High Velocity Hurricane Zone
- H. Test Protocols TAS 201-94, TAS 202-94 and TAS 203-94.

1.3 PERFORMANCE REQUIREMENTS

- A.** Unit Skylights must be tested to NFRC and AAMA/WDMA/CSA 101/I.S.2/A440-08 and AAMA/WDMA/CSA 101/I.S.2/A440-05.
 1. Performance Class: CW
 2. Performance Grade (load capacity): 30 positive and negative
- B. Unit Skylight Standard: Manufactured and Tested per FM 4431 Standard.
- C. Miami Dade – Florida Building Code High Velocity Hurricane Zone Test Protocols; TAS 201-94, TAS 202-94 and TAS 203-94. Units must have both NOA approval and Florida Building Code approval.
- D. Air Infiltration per ASTM E283@ 6.27 PSF shall be greater than 0.01.

- E. Water Penetration per ASTM E331 @ 10 PSF shall be 0.0.
- F. Skylight must comply with OSHA – CFR's (Construction Federal Regulations) for fall protection.
- G. Light Transmission – minimum .60 percent.
- H. U Factor – maximum 0.71.
- I. Solar Heat Gain Coefficient (SHGC) – maximum 0.26.
- J. U Factor – maximum 0.55.
- K. Solar Heat Gain Coefficient (SHGC) – maximum 0.54
- L. Drop Test: The skylight must pass the new pending ASTM drop test. This test requires a 267 lbs. canvas sack with a 5-inch diameter bull nose be dropped from a height of 36.1-inches on the center of the skylight. The glazing may not break or tear away from the frame in such a manner that could create a fall through hazard.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of unit skylight.
- B. Shop Drawings: For unit skylight work. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
- C. Product Data: Provide NFRC thermal performance values, and NAFS testing.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification data.
- B. Product test reports.
- C. Field quality-control reports.
- D. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.7 WARRANTY

- A. **Defects and Leakproof Warranty:** Provide written warranty signed by manufacturer, agreeing to repair or replace work which exhibits defects in materials or workmanship and guaranteeing weather tight and leak free performance. "Defects" is defined as uncontrolled leakage of water and abnormal aging or deterioration. Warranty period shall be 5 years commencing on Date of Substantial Completion.

- B. **Yellowing and Light Transmission Loss Warranty:** Provide written warranty signed by manufacturer against excessive yellowing and light transmission loss. The yellowness index (Y1) shall be less than 5 during a five year period from the date of sale and shall be less than 10 during a ten year period from the date of sale, as determined by ASTM D1925 and as measured by a Gardner Colorimeter. Light transmission shall not decrease more than 5% during a five year period from the date of sale and shall not decrease more than 7% during a ten year period from the date of sale, when tested by the procedure specified in ASTM D1003, as measured by a Gardner Colorimeter. If excessive yellowing or light transmission loss, as defined here, occurs prior to seven years manufacturer will replace the effected domes only at no cost to the purchaser. If excessive yellowing or light transmission loss, as defined here, occurs after seven years and prior to ten years manufacturer will replace the effected domes only at a cost to the purchaser of 1/120th of the original skylight purchase price for each month from the date of sale.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Kingspan Light + Air: 28662 N. Ballard Dr., Lake Forest, IL 60045, PH: 800-759-6985 web: info@kingspanlightandair.us
 - a. Model Tufflite Polycarbonate FM #6072-HWHS-SF-2-CPC-WPC-12 - INS-MF
 - b. NO SUBSTITUTION ALLOWED

2.2 COMPONENTS

- A. Aluminum Frame and Frame Cap:
1. 6063-T5 architectural grade aluminum with mill finish.
 2. The frame dimensions must be a minimum of 0.075-inch-thick, and fully welded all corners, watertight. Frame fasteners #10 x 3/8-inch hex head screws/neoprene washers on 6-inch centers.
 3. The frame must have a full perimeter condensation trough measuring a minimum of 0.625-inches wide and 0.375-inches deep with a minimum of six non-clog weep holes routed to the outside of the frame.
 4. Frame cap dimensions must be a minimum of 0.075-inch-thick, and squared and flat prior to full heli-arc welding. Cap fasteners #10 x 1-inch hex head screws/neoprene washers spaced 4-inches from corner and on 8-inch centers.
 5. The skylight must be built with an integral 9-inch-high curb of double wall construction, consisting of a single 0.090-inch-thick extruded internal aluminum wall and 1.0-inch thick polyisocyanurate insulation adhered to the metal curb. The outside wall of the curb shall consist of a single 0.032-inch-thick aluminum sheet. All curb seams must be fully welded to provide a watertight curb. Curb roof flanges must be 4.0-inches. A separate skylight and curb assembly is not an acceptable substitution for an integral curb skylight unit.

6. Glazing shall be sealed and bonded to frame using Monsanto's UL Listed, engineered thermoplastic Santoprene for complete air and water tightness. No substitution allowed.

B. High Performance Double Glazing

1. Outer glazing: must be formed from GE Lexan SGC100 with XL10 UV protection and must be a minimum thickness of 0.118-inches with a 10-inch rise. No substitution allowed.
2. Inner glazing: must be formed from GE Lexan SGC100 with XL10 UV protection and must be a minimum thickness of 0.094-inches with a 9-inch rise. No substitution allowed.
3. Both the outer and inner glazings must be of a radial bubble contour as shown in illustration 1.0 below and may not have a rib shaped design with tight radius to eliminate shadowing and the resultant restriction of light into the interior of the building. No substitution allowed.
4. To achieve maximum light transmission to the interior of the building the inside curb dimension of the skylight may not be less than 60-inches by 72-inches, providing a full 30-square-foot viewing area.
5. The dome material must be tested for and PASS: A) UBC-26-7 and ASTM D635-06 Rate-of-Burn achieving a minimum CC1 rating. B) ASTM D-2843-99 Smoke Density Test C) ASTM D1929-96 Ignition Temperature Test (Self Ignition).

C. Aluminum Finishes

1. Mill Finish: Manufacturer's standard.
2. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018-mm or thicker.

D. Acrylic Glazing: ASTM D 4802, thermoformable, monolithic sheet, category as standard with manufacturer, Finish 1 (smooth or polished), Type UVF (formulated with UV absorber).

1. Single-Glazing Profile: Inner Dome.
2. Thickness: Not less than thickness required to exceed performance requirements.
3. Color: White, translucent.
4. Self-Ignition Temperature: 650 deg F or more for plastic sheets in thickness indicated when tested according to ASTM D 1929.
5. Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested according to ASTM E 84, and smoke density of 75 or less when tested according to ASTM D 2843
6. Burning Characteristics: Tested according to ASTM D 635. Class CC2, burning rate of 2-1/2-inches-per-minute or less for nominal thickness of 0.060-inch or thickness indicated for use.

E. Polycarbonate Glazing: Thermoformable, extruded monolithic sheets, UV resistant, burglar-resistance rated according to UL 972, and with average impact strength of 12 to 16 ft-lb/in. of width when tested according to ASTM D 256, Test Method A (Izod).

1. Single-Glazing Profile: Outer Dome.

- a. Thickness: Not less than thickness required to exceed performance requirements.
 - b. Color: Clear.
- 2. Self-Ignition Temperature: 650 deg F or more for plastic sheets in thickness indicated when tested according to ASTM D 1929.
- 3. Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested according to ASTM E 84, and smoke density of 75 or less when tested according to ASTM D 2843
- 4. Burning Characteristics: Tested according to ASTM D 635. Class CC1, burning extent of 1-inch or less for nominal thickness of 0.060-inch or thickness indicated for use.
- F. Glazing Gaskets: Manufacturer's standard.
- G. Prefabricated Curb: As specified in Section 077200 "Roof Accessories."
- H. Condensation Control: Fabricate unit skylights with integral internal gutters and non-clogging weeps to collect and drain condensation to the exterior.
- I. Thermal Break: Fabricate unit skylights with thermal barrier separating exterior and interior metal framing.
- J. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened. Provide non-removable fastener heads.
- K. Unit Shape and Size: Rectangular, Double Dome, outside curb dimensions 63" x 75"

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.
- B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.

3.2 FIELD QUALITY CONTROL

- A. After completion of installation and nominal curing of sealant and glazing compounds but before installation of interior finishes, test for water leaks according to AAMA 501.2.
- B. Perform test for total area of each unit skylight.
- C. Work will be considered defective if it does not pass tests and inspections.

- D. Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.3 CLEANING

- A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.

END OF SECTION 086200

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SECTION 087100 - DOOR HARDWARE (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
2. Cylinders for door hardware.
3. Thresholds.
4. Weather-stripping, seals, and door gaskets.
5. Keying Schedule.
6. Electrified door hardware (where indicated on drawings).

B. Products furnished, but not installed, under this Section include the products listed below. Coordinating and scheduling the purchase and delivery of these products remain requirements of this Section.

1. Thresholds, weather stripping and lock cylinders to be installed under other Sections.
2. Store Director to install permanent cores under the supervision of the Contractor.
3. Contractor to provide direction to Store Director for programming E-Plex 2000 Push Button.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Details of electrified door hardware (if indicated on Drawings).

C. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.

- 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
1. For door hardware, an Architectural Hardware Consultant (AHC).
- C. Source Limitations: Provide electrified door hardware (where indicated on Drawings) from same manufacturer as mechanical door hardware, unless otherwise indicated.
- D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- F. Electrified Door Hardware (where indicated on Drawings): Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- G. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- H. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2-inch (13 mm) high for interior doors and 1/2-inch (13 mm) high for exterior swinging/sliding doors.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3-inches (75 mm) from the latch, measured to the leading edge of the door.

1.4 REQUIRED VENDOR

- A. Refer to Drawings for list of Owner's Required Vendors.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- B. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
 - a. Electromagnetic and Delayed-Egress Locks: Five (5) years from date of Substantial Completion.
 - b. Exit Devices: Two (2) years from date of Substantial Completion.
 - c. Manual Closers: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
 1. Door Hardware Sets: Provide quantity, item, size, finish, or color indicated.

2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by descriptive titles corresponding to requirements specified in Part 2.

2.2 MANUFACTURER'S

A.	<u>Manufacturers Used</u>	<u>Code</u>
	Rockwood	(R)
	Glynn Johnson	(G)
	Hager	(H)
	Falcon Lock	(F)
	Trimco	(T)
	Von Duprin	(V)
	Norton	(N)
	Pemko	(P)
	Detex	(D) (Detex Box Finish – Grey)
	Kaba	(KABA)
	GMS	(GMS)
	DoorScope	(DS)
	Schlage	(S)
	Curries	(C)
	S. Parker	(SP)
	Ives	(I)
	DynaLock	(DL)

2.3 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.4 SELF-CLOSING HINGES AND PIVOTS

A. Self-Closing Hinges and Pivots: BHMA A156.17.

2.5 CENTER-HUNG AND OFFSET PIVOTS

A. Center-Hung and Offset Pivots: BHMA A156.4.

2.6 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 3-9/16-inches (90 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

2.7 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in Door Hardware Schedule.

2.8 AUXILIARY LOCKS

- A. Bored Auxiliary Locks: BHMA A156.5: Grade 2; with strike that suits frame.

2.9 ELECTROMAGNETIC LOCKS

- A. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, as required by application indicated.

2.10 ELECTROMECHANICAL LOCKS

- A. Electromechanical Locks: BHMA A156.25; Grade as indicated; motor or solenoid driven; with strike that suits frame.

2.11 SELF-CONTAINED ELECTRONIC LOCKS

- A. Self-Contained Electronic Locks: ANSI/BHMA A156.25 Grade 1, mortise deadbolt with internal, battery-powered, self-contained electronic locks; consisting of complete lockset with 1-inch throw on mortise deadbolt, motor-driven lock mechanism, and actuating device; 12-button 3x4 matrix keypad reader; enclosed in zinc-dichromate-plated, wrought-steel case, and strike that suits frame. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock.

2.12 EXIT LOCKS AND EXIT ALARMS

- A. Exit Locks and Alarms: BHMA A156.29, Grade 1.
- B. Exit Locks: Surface mounted; battery powered, housed in metal case; with manufacturer's standard strike that suits frame; with red-and-white lettering reading "EMERGENCY EXIT PUSH TO OPEN--ALARM WILL SOUND."
- C. Stand-Alone Exit Alarms: Surface mounted on door or mounted separate from door and activated by door movement switch (as indicated).

2.13 SURFACE BOLTS

- A. Surface Bolts: BHMA A156.16.

2.14 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

2.15 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

- A. Automatic and Self-Latching Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

2.16 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.

2.17 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
- B. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.18 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Submit construction cores to the Academy CPM prior to building possession by the owner.
Coordinate final keying with Academy Rep.
 - 2. The contractor shall be required to provide hardware and keying for all doors.
 - 3. The contractor shall install color coded construction cores.
 - 4. On date of Turnover – GC to coordinate with Academy Fixturing/Merchandising Lead and schedule date to transfer doors from “project keys” to “active store keys”.

2.19 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.

2.20 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; as selected by Owner, aluminum, brass, bronze, or stainless steel, unless otherwise indicated.

2.21 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- C. Flat Overlapping Security Astragals: BHMA A156.22; flat galvanized steel continuously factory welded to the face of all exterior doors; minimum 1/8-inch-thick (12-gauge) by 1-1/2-inches (38.1 mm) wide by full height of door. Prime and paint to match door finish.

- D. Rigid, Housed Astragals: BHMA A156.22; gasket material held in place by metal housing; fastened to face of door with screws.
- E. Overlapping-with-Gasket Astragals: BHMA A156.22; T-shaped metal, surface mounted on edge of door with screws; with integral gasket and base metal.

2.22 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. At all exterior hollow metal doors, the degree of door swing to be set at 90 degrees.

2.23 CONCEALED CLOSERS

- A. Concealed Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.24 CLOSER HOLDER RELEASE DEVICES

- A. Closer Holder Release Devices: BHMA A156.15; Grade 1; closer connected with separate or integral releasing and fire- or smoke-detecting devices. Door shall become self-closing on interruption of signal to release device. Automatic release is activated by smoke detection system and/or loss of power.

2.25 AUTOMATIC DOOR HOLDERS AND STOPS

- A. Floor-Mounted Stops: BHMA A156.16; type as indicated in door hardware schedule, polished cast brass base metal.

2.26 ELECTROMAGNETIC STOPS AND HOLDERS

- A. Electromagnetic Door Holders: BHMA A156.15, Grade 1; as indicated or required, wall-mounted electromagnetic single, floor-mounted electromagnet single, or floor-mounted electromagnet double unit with strike plate attached to swinging door; coordinated with fire detectors and interface with fire alarm system for labeled fire-rated door assemblies.

2.27 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8; type and grade as indicated in door hardware schedule.

2.28 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested

according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

2.29 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.30 SLIDING DOOR HARDWARE

- A. Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.

2.31 SWINGING DOOR HARDWARE

- A. Swinging Door Hardware: BHMA A156.10; consisting of complete sets including power operators, closers, and accessories indicated.

2.32 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; as selected by Owner, fabricated from 0.050-inch- (1.3-mm-) thick aluminum, brass, bronze, or stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

2.33 PLASTIC PROTECTION PLATES

- A. Plastic Protection Plates: BHMA A156.6; fabricated with four sides beveled; rigid plastic; 0.060-inch- (1.5-mm-) thick, PVC or acrylic-modified vinyl plastic.

2.34 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
- B. Wide Angle Door Viewer: Optical glass lenses, adjustable to door thickness, and permitting 1-way observation with minimum 168° viewing angle.
 - 1. DoorScope DS238 brass finish.
- C. Door Buzzer
 - 1. Refer to Electrical Drawings for Door Buzzer information.

2.35 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Fire-Rated Applications:
 - a. Machine Screws: For the following:

- 1) Hinges mortised to doors or frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
- b. Steel Through Bolts: For the following unless door blocking is provided:
- 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
 4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.36 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors with Acrovyn Wrap and Steel Frames with Acrovyn Wrap: For surface applied door hardware, drill and tap doors and frames according to ANSI/WDMA I.S. 1A-13
- C. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
 3. Custom Wood Doors: ANSI/WDMA I.S. 1A-13.
- D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30-inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- F. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30-inches (750 mm) of door height greater than 90 inches (2286 mm).
- G. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 1. Contractor to remove construction cores as directed by Owner. Store Director to install permanent cores under the supervision of the Contractor.
- H. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- I. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room. Verify location with Architect.
 1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.
- J. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- K. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- L. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- M. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- N. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- O. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.2 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

3.3 DOOR HARDWARE SCHEDULE

- A. Refer to Drawings, Door Schedule for doors and their corresponding Hardware Set numbers.

- B. **Hardware Set 1**: Each to have:

Swinging Entry Doors: 101A, 101C, 101E & 101F Entry (Single Cylinder Each)

1 ea.	Cylinders	C987 x	Finish to match door	(F)

1 ea.	Thumb Turn	M-118T	Finish to match door	(GMS)

All other hardware by door supplier.

- C. **Hardware Set 2:** Single & Double Leaf Hollow Metal Exit Doors and Frames - Each to Have (Pair = PR, Single = S) 103A, 103B, 103C & 103D, Sales (S), 111A Corridor (S), 118D Receiving (S):

(PR) 2 ea. (S) 1 ea Cylinder C987 x Finish to Match Door x 1 Core
(F)

(PR) 2 ea. (S) 1 ea. Cont. Geared Hinge 224XY x 83" Full Surface-Swing Clear
- US28 (Security Hinge) (I)

(PR) 1 ea. Flat Bar Astragals Flat Surface Astragal-Galvanneal (C)

Or 357 with S88 Astragal (P)

Full height, continuously factory welded Flat Bar Astragals at Double Leaf Doors

(S) 1 ea. Flat Bar Astragals Flat Surface Astragal-Galvanneal (C)

Or 3572 Security Astragal (P)

Full height, continuously factory wedged Flat Bar Astragals at Single Leaf Doors

(S) 1 ea.	Exit Device	7100 X US32D Exit Only	(Y)

(PR) 2 ea.	Exit Devices	7100 X US32D Exit Only	(Y)

(PR) 2 ea. (S) 1 ea. Closer w/ DS Arm CLP8501T X 689 (Y)

Degree of door swing to be set at 90 degrees for all exterior HM doors.

(PR) 1 ea. Keyed Removable Mullion 4900U-84(primed, paint to match frame) (H)

At egress doors only. Receiving Pairs of doors see hardware set 12.

(PR) 1 ea. (S) 1 ea.	Threshold	2005-A-V	(P)

(PR) 1 ea.	(S) 1 ea.	Set Weatherstrip	864S-X-N	(H)

(PR) 1 ea. (S) 1 ea.	Set Weatherstrip	8810S-A	(H)
(PR) 1 ea. (S) 1 ea.	Rain Drip Cap	810S-A	(H)

(PR) 1 ea. (S) 1 ea. Door Bottom & Sweep 770S-A-V

(H)

(PR) 1 ea. (S) 1 ea. Key Switch 653-04-SPDT – Finish SF-630

(S)

(PR) 2 ea. Door Viewer DS238: *Only at Receiving 118D*

(DS)

Mounting heights per drawings, both installed in same door leaf.

1 ea. Door Buzzer (Door 118D only) Refer to Electrical Drawings

(PR, see accessories, para. 2.21 above)

Note: For Pairs of doors where a mullion is not wanted, use the following:

(PR) 2 ea. CVR Exit Devices 7130 X US32D Exit Only or

w/ AU672F NL Lockable Trim SFIC (Y)

(S) 1 ea.	Door Alarm	EAX500 w/ SFIC	(D)

(PR)	2 ea.	Door Alarms	EAX500 w/ SFIC	(D)

Delete Mullion when using Concealed Vertical Rod Panic Bars.

➡ Existing Exit Doors to Remain (Takeover / Update Stores), provide the following for each door:

(S) 1 ea.	Exit Device	V40 X 711 Panic	(D)
	OR	7100 X US32D Panic	(Y)
(S) 1 ea.	Dogging Mortise Cylinder Core	3902 w/SFIC	(H)

For Pairs of doors a second panic bar will be required, verify existing center mullion / latching conditions – adjust hardware as required. New cylinder core to be keyed to new store Master Key. Replace all existing weatherstripping. Provide security astragals on the exterior of doors. Replace any damaged or malfunctioning hardware as required.

D. **Hardware Set 3:** Each to have:

118B Receiving, 118C Receiving & 118E Receiving, Coiling Overhead Doors, Roof hatch:

1 ea. Padlock with removable core keyed to rest of building (F)
All other hardware by door supplier.

E. **Hardware Set 4:** (Not Used)

F. **Hardware Set 5:** Each to have:

Standard Manufacturer's Hardware. Reference Section 083830.

118A Receiving - Impact Traffic Door

G. **Hardware Set 6:** Each to have:

115A Training 113A Break Room

1 ea.	Cont. Geared Hinge	224XY x 83" Full Surface-Swing Clear - US28	(I)
1 ea.	Push Plate	1001-3,4x16x630	(T)
1 ea.	Pull Plate	1013-3,4x16x630	(T)
1 ea.	Kickplate	10-inch x 2-inch LDW x 630	(T)
1 ea.	Closer	8501 – Finish 689	(N)
1 ea.	Floor Stop /Holder	491R x US26D	(R)
1 ea.	Silencers	1229A	(T)

H. **Hardware Sets 7:**

109A Cash Count, 114A Janitor, 115 Training, 116A Managers Office, 117A Electrical Room, 120A IDF Room, 123A Gun Vault.

1 ea.	Cont. Geared Hinge	224XY x 83" Full Surface-Swing Clear – US28	(I)
1 ea.	Cont. Geared Hinge	224XY x 83" Full Surface-Swing Clear US711(I)	
	<i>Black Anodized (Security Hinge - at Gun Vault Door(s) only)</i>		
1 ea.	Lockset	T581DG x P5164 x 626 x 1. Core.	(F)

1 ea.	Kickplate	10-inch x 2-inch LDW x 630	(T)
1 ea.	Closer	8501 -Finish 689	(N)
3 ea.	Silencers	1229A	(T)
1 ea.	Flat Bar Astragals	375 -Galvanneal	(P)
		Or Flat Surface Astragal-Galvanneal	(C)

Flat Bar Astragals Only at Gun Vault Door 123A

Full height, continuously factory welded to exterior side of face of door.

Prime and paint per finish schedule.

1 ea.	Exit Device	V40 x 711 EO (Exit Only) Panic w/EAX500 Alarm	(D)
		<i>Exit Device Only at Exit Corridor Doors behind Gun Vault from Sales Floor to the egress corridor.</i>	
1 ea.	Exit Device	7100 x 32D w/ AU627F Trim	(Y)
		<i>Exit Device Only at Electrical Room Doors when applicable.</i>	
1 ea.	Elec. Lock/Keypad Reader	CO-200 CYL 70 KP RHO 626 SFIC L/C <hand> 09-663 10-072 1-3/4 + 1 Core	(S)
		<i>Only at Cash Count, Gun Vault</i>	
1 ea.	Threshold	2005-A-V (Exterior doors only)	(P)
1 set	Weatherstrip	864S-X-N (Exterior doors only)	(H)
1 ea.	Rain Drip Cap	810S-A (Exterior doors only)	(H)
1 ea.	Door Bottom & Sweep	770S-A-V (Exterior doors only)	(H)

Note: At Gun Vault Door 123A Only: Provide Overhead Stop with no Hold-open.

I. **Hardware Set 8:** Each to have:

Sliding Cart Door: 102A Cart Storage

(Single Cylinder Each)

1 ea.	Cylinders	C987 x	Finish to match door	(F)

All other hardware by door supplier.

J. **Hardware Set 9:** 121A - Riser Room Single Door (Exterior) Single 3'-0" wide x 7'-0" high door (when indicated on the drawings).

1 ea.	Cylinder	C987 x Finish to Match Door x 1 Core	(F)
2 ea.	Pr. Butts	BB 1279 4-1/2 x 4-1/2 x NRP x 600	(H)
1 ea.	Flat Bar Astragals	Flat Surface Astragal-Galvanneal	(C)
		Or 3572 Security Astragal	(P)
		<i>Full height, continuously factory welded Flat Bar Astragals at door</i>	
1 ea.	Lockset	T581DG x P5164 x 626 x 1. Core.	(F)
1 ea.	Closer w/Heavy Duty Stop	CLP8501 – 689	(N)
1 ea.	Threshold	2005-A-V	(P)
1 ea.	Set Weatherstrip	864S-X-N	(H)
1 ea.	Rain Drip Cap	810S-A	(H)
1 ea.	Door Bottom Sweep	770S-A-V	(H)

Hardware Set 9: 121A - Riser Room Double Doors – Pair of 4'-0" wide x 7'-0" high doors (Locations with Fire Pumps and as indicated on the drawings. Interior pairs of doors may need to be fire rated – refer to door schedule):

2 ea.	Cylinders	C987 x Finish to Match Door x 1 Core	(F)
8 ea.	Pair Butts	BB 1191 US32D x NRP x 600	(H)

2 ea. Exit Devices	7100 X US32D x w/AU627F Outside Locking Trim w/Cyl (SFIC)	
2 ea. Closers	CLP8501 X SBL	(N)
1 ea. Threshold	2005-A-V	(P)
1 set Weatherstrip	864S-X-N	(H)
2 ea. Door Bottom Sweep	810S-A	(H)
1 ea. Rain Drip Cap	770S-A-V	(H)
1 ea. Dbl. Doors Astragal Seal	355A-84	(P)
1 ea. Keyed Removable Mullion	4900U-84	(H)

Provide hardware sized for door width. Verify with drawings / Door Schedule.

K. **Hardware Set 10:** Each to have:

101B Entry, Coiling Overhead Shutter

1 ea. Thumb Turn ILC07161TK2A02626 (Centered on int side)
(KABA)

101D Entry, Coiling Overhead Shutter

1 ea. Cylinder IC3726D x 1 Core (Centered on ext. side)
(SP)

102B Cart Storage, Coiling Overhead Shutter

1 ea. Cylinder IC3726D x 1 Core (Offset to right on ext. side)
(SP)

1 ea. Thumb Turn ILC07161TK2A02626 (Centered on int side)
(KABA)

123B thru F, provide (centered) keyed lock at mortise cylinder.

All other hardware by door supplier.

L. **Hardware Set 11:** (Not included in prototype use where applicable)

Pocket Door – All pocket door hardware provided by dor hardware vendor/supplier; including heavy duty metal box-track, wheels, guides, adjustable hangers, adjustable stops/limiters and pulls. Reference door specification: Acrovyn PC5-NR by Construction Specialties, www.c-sgroup.com

M. **Hardware Set 12:** Double Leaf Exit /Service Doors (Receiving Area – Existing Stores Where Applicable – door number may vary) - Each to Have:

3 pair SS Hinges	BB1191 4.5 X 4.5 NRP – 630	(H)
1 ea. Mortise Cylinder	C987 x SFIC Finish to Match Door	(F)
1 ea. SFIC Core	C647 – 626	(F)
1 ea. Exit Device	7100 X US32D Exit Only	(Y)
1 ea. Alarm	EAX500 Door Alarm w/SFIC	(D)
1 ea. Storeroom Exit Strike	09DN X S (Global Axiom) – 630	(D)

- 1 ea. Double Door Strike 94 Advantex (Global Axiom) – US32D (D)
- 1 pair Flushbolts 282D – 626 (H)
- 1 ea. Closer w/Unitrol Arm CLP8501 (ACT) - 689 (N)
- Degree of door swing to be set at 90 degrees for all exterior HM doors.*
- 1 ea. Threshold 2005-A-V X Door Width (P)
- 1 ea. T-Astragal 355CS X 84" (P)
- 1 ea. Set Weatherstrip 296CR X Door Width x 84 - Alum (H)
- 1 ea. Door Sweep w/Drip Cap 345AV (36" ACT / Door Width INA) (H)
- 1 ea. Rain Drip Cap 346C X 64" - Alum (P)
- 1 ea. Armor Plate 190S 30X34 (ACT) / 30X Door Width Less 2" – 30 (H)
- 2 ea. Door Viewer DS238 (DS)

Mounting heights per drawings, both installed in active leaf.

- 1 ea. Door Buzzer Refer to Electrical Drawings
- (See accessories, para. 2.21, & 2.34 above) (Refer to door 118D below for keying)

For existing exit / service doors to remain refer to Hardware Set 2, above, for panic / keying / hardware information.

N. **Hardware Set 13:** Not Used.

- O. **Hardware Set 14:** For use at single storefront display case doors at takeover stores only. Special manufacturer display case hardware to be provided by the storefront vendor, as follows:

- 3 ea. Self Closing Hinges
- 1 ea. Heavy Duty Mortise Cylinder Lock(s) - cylinder(s) to match store type.
- 1 ea. Pull Plate / Pull – Small, not easily noticeable
- 1 ea. Threshold – Finish to match door frame
- 1 ea. Set Weatherstripping sized to fit door
- 1 ea. Door Bottom Sweep w/Drip Cap

Note: Coordinate hardware finishes with storefront finish. Door to be keyed to store location master key. Coordinate with storefront vendor for additional specific requirements. Provide adequate locking to deter break-ins.

3.4 KEYING SCHEDULE

- A. All items necessary for final hardware and keying may not be included on the keying schedule below. It is the responsibility of the general contractor to coordinate final hardware and keying.
- B. Each key is to be stamped according to how many are required. For example – the Master Keys would be stamped as M1, M2, M3, M4, and so on as indicated on the schedule below.
- C. General Contractor to provide (per rooms indicated or when not indicated, per rooms required by Owner as indicated on Drawings):
 - 1. Master Keys 10-keys M-Master all locks, cylinders, IC cores and

- padlocks are to be keyed to the master on Falcon hardware.
2. Training Room 10-keys TR-Training Room to be keyed to the master but separately, on its own key
 3. Janitor 10-keys JR-Janitors Room to be keyed to the master but separately, on its own key
 4. Managers Office A 10-keys MA-Manager A to be keyed to the master but separately, on its own key
 5. Managers Office A/Training 10-keys MA-Manager A to be keyed to the master but separately, on its own key
 6. IT Brain Boxes NA NA Cylinder with IC core keyed to the master only
 7. Electrical NA NA 2-Falcon cylinder and IC core to be keyed to the master only
- D. General Contractor to provide cylinders for Von Duprin (Verify exact amount)
1. Panic-Von Duprin NA NA
- E. General Contractor to provide hardware for Record-USA Automatic Doors
1. Auto Doors NA NA 5-Falcon cylinders with IC cores. 5-thumbturns - schedule placement with the owner, keyed to master only
- F. General Contractor to provide hardware for Metro Security Shutters
1. Security Shutters NA NA 3-S Parker cylinders with IC cores. 2-thumbturns - schedule placement with the owner, keyed to master only
 2. Hunting Counter Security Shutters
10 keys NA 5-S Parker cylinders with IC cores.
Schedule placement with the owner, keyed to master only
- G. General Contractor to provide padlocks: (Verify exact amount with owner)
1. Padlock OD 10-keys OD-outdoor 10-padlocks with IC cores are to be keyed separately but to the master. will lock propane cages and outdoor displays
 2. Padlock PA NA NA 25-padlocks with IC cores are to be keyed to the master only. Will secure night bars, roll up doors, roof hatch, riser room and compactor door
- H. After fixtures are installed, lock-smithing will be required.
1. (2) Two cash drawers at Customer Service POS counters need to be keyed alike. Stamped CS
- I. All fixture lock-smithing will need a total of (15) fifteen keys each.

J. General Contractor to provide & install night-time exit security bars on all exterior hollow metal doors. The only approved exit security bar is the Hook-On Series by Exit Security. Bar needs to be sized according to the size of the exit door. GC is responsible for installing hanging brackets. Verify locations of hanging brackets with Academy PM.

K.

		DISTRICT MANAGER 10 Key's stamped DM	STORE MANAGERS 10 Key's stamped SM	JANITORS 10 Key's stamped J	CAMPING 10 Key's stamped C	GENERAL ASSO. 10 Key's stamped GA	HUNTING CNTR STORE MANAGER (10) Key's stamped HC.
101A	ENTRY DOOR (EXTERIOR)		X				
101B	ENTRY SHUTTER (EXTERIOR)		X				
101C	ENTRY DOOR (EXTERIOR)		X				
101D	EXIT SHUTTER (EXTERIOR)		X				
101E	ENTRY DOOR (INTERIOR)		X				
101F	ENTRY DOOR (INTERIOR)		X				
102A	CART STORAGE DOOR (EXTERIOR)		X			X	
102B	CART STORAGE SHUTTER (EXTERIOR)		X				
103A	SALES SCHLAGE (LEFT FRONT)		X				
103B	SALES SCHLAGE (RIGHT FRONT)		X				
103C	SALES SCHLAGE (RIGHT REAR)		X				
103D	SALES SCHLAGE (LEFT REAR)		X				
109A	CASH COUNT SCHLAGE						
111A	CORRIDOR		X				
113	BREAK ROOM		X				
114	JANITOR		X	X			
115	TRAINING	X	X	X	X	X	
116	MANAGERS OFFICE B	X					
117	ELECTRICAL ROOM (INTERIOR)		X				
117B	ELECTRICAL ROOM (EXTERIOR)		X				
118D	RECEIVING (AT BACK WALL OF RECEIVING)		X				
120A	IDF ROOM (AT REAR)		X				
121A	RISER ROOM		X				
123A	GUN VAULT SCHLAGE						X
123B thru F	HUNTING CNTR PISTOL DISPLAY CASE						X
	QTY 25 PADLOCKS 2-1/2"		X				

	QTY 10 PADLOCKS 2-1/2"		X		X		

GC to provide night-time exit security bars on all exterior man doors.
All keys to be labeled.

END OF SECTION 087111

SECTION 087100 - DOOR HARDWARE (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
2. Cylinders for door hardware.
3. Thresholds.
4. Weather-stripping, seals, and door gaskets.
5. Keying Schedule.
6. Electrified door hardware (where indicated on drawings).

B. Products furnished, but not installed, under this Section include the products listed below. Coordinating and scheduling the purchase and delivery of these products remain requirements of this Section.

1. Thresholds, weather stripping and lock cylinders to be installed under other Sections.
2. Store Director to install permanent cores under the supervision of the Contractor.
3. Contractor to provide direction to Store Director for programming E-Plex 2000 Push Button.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Details of electrified door hardware (if indicated on Drawings).

C. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.

- 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
 1. For door hardware, an Architectural Hardware Consultant (AHC).
- C. Source Limitations: Provide electrified door hardware (where indicated on Drawings) from same manufacturer as mechanical door hardware, unless otherwise indicated.
- D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- F. Electrified Door Hardware (where indicated on Drawings): Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- G. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- H. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2-inch (13 mm) high for interior doors and 1/2-inch (13 mm) high for exterior swinging/sliding doors.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3-inches (75 mm) from the latch, measured to the leading edge of the door.

1.4 REQUIRED VENDOR

- A. Refer to Drawings for list of Owner's Required Vendors.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- B. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
 - a. Electromagnetic and Delayed-Egress Locks: Five (5) years from date of Substantial Completion.
 - b. Exit Devices: Two (2) years from date of Substantial Completion.
 - c. Manual Closers: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.
 1. Door Hardware Sets: Provide quantity, item, size, finish, or color indicated.

2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by descriptive titles corresponding to requirements specified in Part 2.

2.2 MANUFACTURER'S

A.	<u>Manufacturers Used</u>	<u>Code</u>
	Rockwood	(R)
	Glynn Johnson	(G)
	Hager	(H)
	Falcon Lock	(F)
	Trimco	(T)
	Von Duprin	(V)
	Norton	(N)
	Pemko	(P)
	Detex	(D) (Detex Box Finish – Grey)
	Kaba	(KABA)
	GMS	(GMS)
	DoorScope	(DS)
	Schlage	(S)
	Curries	(C)
	S. Parker	(SP)
	Ives	(I)
	DynaLock	(DL)

2.3 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.4 SELF-CLOSING HINGES AND PIVOTS

A. Self-Closing Hinges and Pivots: BHMA A156.17.

2.5 CENTER-HUNG AND OFFSET PIVOTS

A. Center-Hung and Offset Pivots: BHMA A156.4.

2.6 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 3-9/16-inches (90 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

2.7 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in Door Hardware Schedule.

2.8 AUXILIARY LOCKS

- A. Bored Auxiliary Locks: BHMA A156.5: Grade 2; with strike that suits frame.

2.9 ELECTROMAGNETIC LOCKS

- A. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, as required by application indicated.

2.10 ELECTROMECHANICAL LOCKS

- A. Electromechanical Locks: BHMA A156.25; Grade as indicated; motor or solenoid driven; with strike that suits frame.

2.11 SELF-CONTAINED ELECTRONIC LOCKS

- A. Self-Contained Electronic Locks: ANSI/BHMA A156.25 Grade 1, mortise deadbolt with internal, battery-powered, self-contained electronic locks; consisting of complete lockset with 1-inch throw on mortise deadbolt, motor-driven lock mechanism, and actuating device; 12-button 3x4 matrix keypad reader; enclosed in zinc-dichromate-plated, wrought-steel case, and strike that suits frame. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock.

2.12 EXIT LOCKS AND EXIT ALARMS

- A. Exit Locks and Alarms: BHMA A156.29, Grade 1.
- B. Exit Locks: Surface mounted; battery powered, housed in metal case; with manufacturer's standard strike that suits frame; with red-and-white lettering reading "EMERGENCY EXIT PUSH TO OPEN--ALARM WILL SOUND."
- C. Stand-Alone Exit Alarms: Surface mounted on door or mounted separate from door and activated by door movement switch (as indicated).

2.13 SURFACE BOLTS

- A. Surface Bolts: BHMA A156.16.

2.14 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

2.15 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

- A. Automatic and Self-Latching Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

2.16 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.

2.17 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
- B. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.18 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Submit construction cores to the Academy CPM prior to building possession by the owner.
Coordinate final keying with Academy Rep.
 - 2. The contractor shall be required to provide hardware and keying for all doors.
 - 3. The contractor shall install color coded construction cores.
 - 4. On date of Turnover – GC to coordinate with Academy Fixturing/Merchandising Lead and schedule date to transfer doors from “project keys” to “active store keys”.

2.19 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.

2.20 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; as selected by Owner, aluminum, brass, bronze, or stainless steel, unless otherwise indicated.

2.21 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- C. Flat Overlapping Security Astragals: BHMA A156.22; flat galvanized steel continuously factory welded to the face of all exterior doors; minimum 1/8-inch-thick (12-gauge) by 1-1/2-inches (38.1 mm) wide by full height of door. Prime and paint to match door finish.

- D. Rigid, Housed Astragals: BHMA A156.22; gasket material held in place by metal housing; fastened to face of door with screws.
- E. Overlapping-with-Gasket Astragals: BHMA A156.22; T-shaped metal, surface mounted on edge of door with screws; with integral gasket and base metal.

2.22 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. At all exterior hollow metal doors, the degree of door swing to be set at 90 degrees.

2.23 CONCEALED CLOSERS

- A. Concealed Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.24 CLOSER HOLDER RELEASE DEVICES

- A. Closer Holder Release Devices: BHMA A156.15; Grade 1; closer connected with separate or integral releasing and fire- or smoke-detecting devices. Door shall become self-closing on interruption of signal to release device. Automatic release is activated by smoke detection system and/or loss of power.

2.25 AUTOMATIC DOOR HOLDERS AND STOPS

- A. Floor-Mounted Stops: BHMA A156.16; type as indicated in door hardware schedule, polished cast brass base metal.

2.26 ELECTROMAGNETIC STOPS AND HOLDERS

- A. Electromagnetic Door Holders: BHMA A156.15, Grade 1; as indicated or required, wall-mounted electromagnetic single, floor-mounted electromagnet single, or floor-mounted electromagnet double unit with strike plate attached to swinging door; coordinated with fire detectors and interface with fire alarm system for labeled fire-rated door assemblies.

2.27 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8; type and grade as indicated in door hardware schedule.

2.28 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested

according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

2.29 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.30 SLIDING DOOR HARDWARE

- A. Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.

2.31 SWINGING DOOR HARDWARE

- A. Swinging Door Hardware: BHMA A156.10; consisting of complete sets including power operators, closers, and accessories indicated.

2.32 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; as selected by Owner, fabricated from 0.050-inch- (1.3-mm-) thick aluminum, brass, bronze, or stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

2.33 PLASTIC PROTECTION PLATES

- A. Plastic Protection Plates: BHMA A156.6; fabricated with four sides beveled; rigid plastic; 0.060-inch- (1.5-mm-) thick, PVC or acrylic-modified vinyl plastic.

2.34 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
- B. Wide Angle Door Viewer: Optical glass lenses, adjustable to door thickness, and permitting 1-way observation with minimum 168° viewing angle.

- 1. DoorScope DS238 brass finish.

- C. Door Buzzer

- 1. Refer to Electrical Drawings for Door Buzzer information.

2.35 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

- 1. Fire-Rated Applications:

- a. Machine Screws: For the following:

- 1) Hinges mortised to doors or frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
- b. Steel Through Bolts: For the following unless door blocking is provided:
- 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
 4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.36 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors with Acrovyn Wrap and Steel Frames with Acrovyn Wrap: For surface applied door hardware, drill and tap doors and frames according to ANSI/WDMA I.S. 1A-13
- C. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
 3. Custom Wood Doors: ANSI/WDMA I.S. 1A-13.
- D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30-inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- F. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30-inches (750 mm) of door height greater than 90 inches (2286 mm).
- G. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 1. Contractor to remove construction cores as directed by Owner. Store Director to install permanent cores under the supervision of the Contractor.
- H. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- I. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room. Verify location with Architect.
 1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.
- J. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- K. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- L. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- M. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- N. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- O. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.2 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

3.3 DOOR HARDWARE SCHEDULE

- A. Refer to Drawings, Door Schedule for doors and their corresponding Hardware Set numbers.

- B. **Hardware Set 1**: Each to have:

Swinging Entry Doors: 101A, 101C, 101E & 101F Entry (Single Cylinder Each)

1 ea.	Cylinders	C987 x	Finish to match door	(F)

1 ea.	Thumb Turn	M-118T	Finish to match door	(GMS)

All other hardware by door supplier.

- C. **Hardware Set 2:** Single & Double Leaf Hollow Metal Exit Doors and Frames - Each to Have (Pair = PR, Single = S) 103A, 103B, 103C & 103D, Sales (S), 111A Corridor (S), 118D Receiving (S):

(PR) 2 ea. (S) 1 ea Cylinder C987 x Finish to Match Door x 1 Core
(F)

(PR) 2 ea. (S) 1 ea. Cont. Geared Hinge 224XY x 83" Full Surface-Swing Clear
- US28 (Security Hinge) (I)

(PR) 1 ea. Flat Bar Astragals	Flat Surface Astragal-Galvanneal	(C)

Or 357 with S88 Astragal (P)

Full height, continuously factory welded Flat Bar Astragals at Double Leaf Doors

(S) 1 ea. Flat Bar Astragals Flat Surface Astragal-Galvanneal (C)

Or 3572 Security Astragal (P)

Full height, continuously factory wedged Flat Bar Astragals at Single Leaf Doors

(S) 1 ea.	Exit Device	7100 X US32D Exit Only	(Y)

(PR) 2 ea.	Exit Devices	7100 X US32D Exit Only	(Y)

(PR) 2 ea. (S) 1 ea. Closer w/ DS Arm CLP8501T X 689 (Y)

Degree of door swing to be set at 90 degrees for all exterior HM doors.

(PR) 1 ea. Keyed Removable Mullion 4900U-84(primed, paint to match frame) (H)

At egress doors only. Receiving Pairs of doors see hardware set 12.

(PR) 1 ea. (S) 1 ea.	Threshold	2005-A-V	(P)

(PR) 1 ea. (S) 1 ea. Set Weatherstrip 864S-X-N (H)

(PR) 1 ea. (S) 1 ea.	Get Weatherstrip	881S-A	(H)
(PR) 1 ea. (S) 1 ea.	Rain Drip Cap	810S-A	(H)

(PR) 1 ea. (S) 1 ea. Door Bottom & Sweep 770S-A-V

(H)

(PR) 1 ea. (S) 1 ea. Key Switch 653-04-SPDT – Finish SF-630

(S)

(PR) 2 ea. Door Viewer DS238: *Only at Receiving 118D*

(DS)

Mounting heights per drawings, both installed in same door leaf.

1 ea. Door Buzzer (Door 118D only) Refer to Electrical Drawings

(PR, see accessories, para. 2.21 above)

Note: For Pairs of doors where a mullion is not wanted, use the following:

(PR) 2 ea. CVR Exit Devices 7130 X US32D Exit Only or

w/ AU672F NL Lockable Trim SFIC (Y)

(S) 1 ea. Door Alarm EAX500 w/ SFIC (D)

(S)	1 ea.	Door Alarm	EAX500 w/ SFIC	
(PR)	2 ea.	Door Alarms	EAX500 w/ SFIC	(D)

Delete Mullion when using Concealed Vertical Rod Panic Bars.

➡ Existing Exit Doors to Remain (Takeover / Update Stores), provide the following for each door:

(S) 1 ea.	Exit Device	V40 X 711 Panic	(D)
	OR	7100 X US32D Panic	(Y)
(S) 1 ea.	Dogging Mortise Cylinder Core	3902 w/SFIC	(H)

For Pairs of doors a second panic bar will be required, verify existing center mullion / latching conditions – adjust hardware as required. New cylinder core to be keyed to new store Master Key. Replace all existing weatherstripping. Provide security astragals on the exterior of doors. Replace any damaged or malfunctioning hardware as required.

D. **Hardware Set 3:** Each to have:

118B Receiving, 118C Receiving & 118E Receiving, Coiling Overhead Doors, Roof hatch:

1 ea. Padlock with removable core keyed to rest of building (F)
All other hardware by door supplier.

E. **Hardware Set 4:** (Not Used)

F. **Hardware Set 5:** Each to have:

Standard Manufacturer's Hardware. Reference Section 083830.

118A Receiving - Impact Traffic Door

G. **Hardware Set 6:** Each to have:

115A Training 113A Break Room

1 ea.	Cont. Geared Hinge	210XY x 83" Full Surface-Swing Clear - US28	
(I)			
1 ea.	Push Plate	1001-3,4x16x630	(T)
1 ea.	Pull Plate	1013-3,4x16x630	(T)
1 ea.	Kickplate	10-inch x 2-inch LDW x 630	(T)
1 ea.	Closer	8501 – Finish 689	(N)
1 ea.	Floor Stop / Holder	491R x US26D	
	(R)		
1 ea.	Silencers	1229A	(T)

H. **Hardware Sets 7:**

109A Cash Count, 114A Janitor, 115 Training, 116A Managers Office, 117A Electrical Room, 120A IDF Room, 123A Gun Vault.

1 ea.	Cont. Geared Hinge	224XY x 83" Full Surface-Swing Clear – US28 (I)	
1 ea.	Cont. Geared Hinge	224XY x 83" Full Surface-Swing Clear –	
US711(I)			
<i>Black Anodized (Security Hinge - at Gun Vault Door(s) only)</i>			
1 ea.	Lockset	T581DG x P5164 x 626 x 1. Core.	(F)
1 ea.	Kickplate	10-inch x 2-inch LDW x 630	(T)
1 ea.	Closer	8501 -Finish 689	(N)
3 ea.	Silencers	1229A	(T)
1 ea.	Flat Bar Astragals	375 -Galvanneal	(P)
		Or Flat Surface Astragal-Galvanneal	(C)
<i>Flat Bar Astragals Only at Gun Vault Door 123A</i>			
<i>Full height, continuously factory welded to exterior side of face of door.</i>			
<i>Prime and paint per finish schedule.</i>			
1 ea.	Exit Device	V40 x 711 EO (Exit Only) Panic w/EAX500	
	Alarm (D)		
<i>Exit Device Only at Exit Corridor Doors behind Gun Vault from Sales Floor to the egress corridor.</i>			
1 ea.	Exit Device	7100 x 32D w/ AU627F Trim	(Y)
<i>Exit Device Only at Electrical Room Doors when applicable.</i>			
1 ea.	Elec. Lock/Keypad Reader	CO-200 CYL 70 KP RHO 626 SFIC L/C <hand>	
		09-663 10-072 1-3/4 + 1 Core	(S)

I. **Hardware Set 8:** Each to have:

Sliding Cart Door: 102A Cart Storage

(Single Cylinder Each)

1 ea.	Cylinders	C987 x	Finish to match door	(F)

All other hardware by door supplier.

J. **Hardware Set 9:** 121A - Riser Room Single Door (Exterior) Single 3'-0" wide x 7'-0" high door (when indicated on the drawings).

1 ea.	Cylinder	C987 x Finish to Match Door x 1 Core	(F)
2 ea.	Pr. Butts	BB 1279 4-1/2 x 4-1/2 x NRP x 600	(H)
1 ea.	Flat Bar Astragals	Flat Surface Astragal-Galvanneal	(C)
		Or 3572 Security Astragal	(P)
<i>Full height, continuously factory welded Flat Bar Astragals at door</i>			
1 ea.	Lockset	T581DG x P5164 x 626 x 1. Core.	(F)
1 ea.	Closer w/Heavy Duty Stop	CLP8501 – 689	
		(N)	
1 ea.	Threshold	2005-A-V	(P)
1 ea.	Set Weatherstrip	864S-X-N	(H)
1 ea.	Rain Drip Cap	810S-A	(H)
1 ea.	Door Bottom Sweep	770S-A-V	(H)

Hardware Set 9: 121A - Riser Room Double Doors – Pair of 4'-0" wide x 7'-0" high doors (Locations with Fire Pumps and as indicated on the drawings. Interior pairs of doors may need to be fire rated – refer to door schedule):

2 ea.	Cylinders	C987 x Finish to Match Door x 1 Core	(F)
4 ea.	Pair Butts	BB 1191 US32D x NRP x 600	(H)

1 ea.	Lockset	T581DG(IC) x 626(F) (Active Leaf)	
	(F)		
1 pair	Flushbolts	282D x 626 (Inactive Leaf)	(H)
2 ea.	Closers	CLP8501 X SBL	(N)
1 ea.	Threshold	2005-A-V	(P)
1 set	Weatherstrip	864S-X-N	(H)
2 ea.	Door Bottom Sweep	810S-A	(H)
1 ea.	Rain Drip Cap	770S-A-V	(H)
1 ea.	Dbl. Doors Astragal Seal	355A-84	(P)

Provide hardware sized for door width. Verify with drawings / Door Schedule.

K. **Hardware Set 10:** Each to have:

101B Entry, Coiling Overhead Shutter

1 ea. Thumb Turn ILCO7161TK2A02626 (Centered on int side)
(KABA)

101D Entry, Coiling Overhead Shutter

1 ea. Cylinder IC3726D x 1 Core (Centered on ext. side)
(SP)

102B Cart Storage, Coiling Overhead Shutter

1 ea. Cylinder IC3726D x 1 Core (Offset to right on ext. side)
(SP)

1 ea. Thumb Turn ILCO7161TK2A02626 (Centered on int side)
(KABA)

123B thru F, provide (centered) keyed lock at mortise cylinder.

All other hardware by door supplier.

L. **Hardware Set 11:** (Not included in prototype use where applicable)

Pocket Door – All pocket door hardware provided by dor hardware vendor/supplier; including heavy duty metal box-track, wheels, guides, adjustable hangers, adjustable stops/limiters and pulls. Reference door specification: Acrovyn PC5-NR by Construction Specialties, www.c-sgroup.com

M. **Hardware Set 12:** Double Leaf Exit /Service Doors (Receiving Area – Existing Stores Where Applicable – door number may vary) - Each to Have:

3 pair	SS Hinges	BB1191 4.5 X 4.5 NRP – 630	(H)
1 ea.	Mortise Cylinder	C987 x SFIC Finish to Match Door	(F)
1 ea.	SFIC Core	C647 – 626	(F)
1 ea.	Exit Device	7100 X US32D Exit Only	(Y)
1 ea.	Alarm	EAX500 Door Alarm w/SFIC	(D)
1 ea.	Storeroom Exit Strike	09DN X S (Global Axiom) – 630	(D)
1 ea.	Double Door Strike	94 Advantex (Global Axiom) – US32D	(D)
1 pair	Flushbolts	282D – 626	(H)

- 1 ea. Closer w/Unitrol Arm CLP8501 (ACT) - 689 (N)
Degree of door swing to be set at 90 degrees for all exterior HM doors.
- 1 ea. Threshold 2005-A-V X Door Width (P)
- 1 ea. T-Astragal 355CS X 84" (P)
- 1 ea. Set Weatherstrip 296CR X Door Width x 84 - Alum (H)
- 1 ea. Door Sweep w/Drip Cap 345AV (36" ACT / Door Width INA) (H)
- 1 ea. Rain Drip Cap 346C X 64" - Alum (P)
- 1 ea. Armor Plate 190S 30X34 (ACT) / 30X Door Width Less 2" – 30 (H)
- 2 ea. Door Viewer DS238 (DS)
- Mounting heights per drawings, both installed in active leaf.*
- 1 ea. Door Buzzer Refer to Electrical Drawings
- (See accessories, para. 2.21, & 2.34 above) (Refer to door 118D below for keying)

For existing exit / service doors to remain refer to Hardware Set 2, above, for panic / keying / hardware information.

N. Hardware Set 13: Not Used.

- O. **Hardware Set 14:** For use at single storefront display case doors at takeover stores only. Special manufacturer display case hardware to be provided by the storefront vendor, as follows:

- 3 ea. Self Closing Hinges
- 1 ea. Heavy Duty Mortise Cylinder Lock(s) - cylinder(s) to match store type.
- 1 ea. Pull Plate / Pull – Small, not easily noticeable
- 1 ea. Threshold – Finish to match door frame
- 1 ea. Set Weatherstripping sized to fit door
- 1 ea. Door Bottom Sweep w/Drip Cap

Note: Coordinate hardware finishes with storefront finish. Door to be keyed to store location master key. Coordinate with storefront vendor for additional specific requirements. Provide adequate locking to deter break-ins.

3.4 KEYING SCHEDULE

- A. All items necessary for final hardware and keying may not be included on the keying schedule below. It is the responsibility of the general contractor to coordinate final hardware and keying.
- B. Each key is to be stamped according to how many are required. For example – the Master Keys would be stamped as M1, M2, M3, M4, and so on as indicated on the schedule below.
- C. General Contractor to provide (per rooms indicated or when not indicated, per rooms required by Owner as indicated on Drawings):
 - 1. Master Keys 10-keys M-Master all locks, cylinders, IC cores and padlocks are to be keyed to the master on Falcon hardware.
 - 2. Training Room 10-keys TR-Training Room to be keyed to the master but

3. Janitor 10-keys JR-Janitors Room to be keyed to the master but separately, on its own key
 4. Managers Office A 10-keys MA-Manager A to be keyed to the master but separately, on its own key
 5. Managers Office A/Training 10-keys MA-Manager A to be keyed to the master but separately, on its own key
 6. IT Brain Boxes NA NA Cylinder with IC core keyed to the master only
 7. Electrical NA NA 2-Falcon cylinder and IC core to be keyed to the master only
- D. General Contractor to provide cylinders for Von Duprin (Verify exact amount)
1. Panic-Von Duprin NA NA
- E. General Contractor to provide hardware for Record-USA Automatic Doors
1. Auto Doors NA NA 5-Falcon cylinders with IC cores. 5-thumbturns - schedule placement with the owner, keyed to master only
- F. General Contractor to provide hardware for Metro Security Shutters
1. Security Shutters NA NA 3-S Parker cylinders with IC cores. 2-thumbturns - schedule placement with the owner, keyed to master only
 2. Hunting Counter Security Shutters
10 keys NA 5-S Parker cylinders with IC cores.
Schedule placement with the owner, keyed to master only
- G. General Contractor to provide padlocks: (Verify exact amount with owner)
1. Padlock OD 10-keys OD-outdoor 10-padlocks with IC cores are to be keyed separately but to the master.
will lock propane cages and outdoor displays
 2. Padlock PA NA NA 25-padlocks with IC cores are to be keyed to the master only. Will secure night bars, roll up doors, roof hatch, riser room and compactor door
- H. After fixtures are installed, lock-smithing will be required.
1. (2) Two cash drawers at Customer Service POS counters need to be keyed alike. Stamped CS
- I. All fixture lock-smithing will need a total of (15) fifteen keys each.
- J. General Contractor to provide & install night-time exit security bars on all exterior hollow metal doors. The only approved exit security bar is the Hook-On Series by Exit Security.

Bar needs to be sized according to the size of the exit door. GC is responsible for installing hanging brackets. Verify locations of hanging brackets with Academy PM.

K.

		DISTRICT MANAGER 10 Key's stamped DM	STORE MANAGERS 10 Key's stamped SM	JANITORS 10 Key's stamped J	CAMPING 10 Key's stamped C	GENERAL ASSO. 10 Key's stamped GA	HUNTING CNTR STORE MANAGER (10) Key's stamped HC.
101A	ENTRY DOOR (EXTERIOR)		X				
101B	ENTRY SHUTTER (EXTERIOR)		X				
101C	ENTRY DOOR (EXTERIOR)		X				
101D	EXIT SHUTTER (EXTERIOR)		X				
101E	ENTRY DOOR (INTERIOR)		X				
101F	ENTRY DOOR (INTERIOR)		X				
102A	CART STORAGE DOOR (EXTERIOR)		X			X	
102B	CART STORAGE SHUTTER (EXTERIOR)		X				
103A	SALES SCHLAGE (LEFT FRONT)		X				
103B	SALES SCHLAGE (RIGHT FRONT)		X				
103C	SALES SCHLAGE (RIGHT REAR)		X				
103D	SALES SCHLAGE (LEFT REAR)		X				
109A	CASH COUNT SCHLAGE						
111A	CORRIDOR		X				
113	BREAK ROOM		X				
114	JANITOR		X	X			
115	TRAINING	X	X	X	X	X	
116	MANAGERS OFFICE B	X					
117	ELECTRICAL ROOM (INTERIOR)		X				
117B	ELECTRICAL ROOM (EXTERIOR)		X				
118D	RECEIVING (AT BACK WALL OF RECEIVING)		X				
120A	IDF ROOM (AT REAR)		X				
121A	RISER ROOM		X				
123A	GUN VAULT SCHLAGE						X
123B thru F	HUNTING CNTR PISTOL DISPLAY CASE						X
	QTY 25 PADLOCKS 2-1/2"		X				
	QTY 10 PADLOCKS 2-1/2"		X		X		

GC to provide night-time exit security bars on all exterior man doors.

All keys to be labeled.

END OF SECTION 087111

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Glass for windows, doors, automatic entrance doors, storefront framing.
2. Glazing sealants and accessories.
3. Fire Protection Rated Glazing for doors and windows in fire resistance rated walls (Where applicable).
4. Laminate-glass security glazing.

1.2 COORDINATION

- ##### A.
- Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 REFERENCES

A. Reference Standards

1. ASTM C 1036 Standard Specification for Flat Glass.
2. ASTM C 1048 Standard Specification for Heat-Strengthened and Full Tempered Flat Glass
3. ASTM C 1172 Specification for Laminated Architectural Flat Glass
4. ASTM E 1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
5. ASTM E 1996 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
6. ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation
7. ASTM E 546 Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units
8. ASTM E 576 Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units in the Vertical Position
9. ASTM E 1300 Standard Practice for Determining Load Resistance of Glass in Buildings
10. ANSI Z97.1 Performance Specifications and Methods of Test for Safety Glazing materials Used in Buildings
11. CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
12. UL 972 Standard for Safety Burglary Resisting Glazing Material.

B. Glass Association of North America (GANA)

1. GANA Glazing Manual
2. GANA Laminated Glazing Reference Manual
3. GANA Bulletin 01-0300 - Proper Procedures for Cleaning Architectural Glass Products

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: Samples of each color required other than clear monolithic vision glass; submit 12 inches square.
- C. Sealant or Gasket: Submit 12-inch-long samples of each color.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Quality Assurance Submittals
 1. Provide test reports indicating products meet or exceed specified requirements.

1.5 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination, material obstruction of vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard. of glass.
 1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Guardian Industries: Corsicana, TX 75109, PH: 903-872-4871.
 - 2. Vitro Architectural Glass., Cheswick, PA 15024, PH 855-887-6457.
 - 3. AGC Glass: Alpharetta, GA 30022, PH 800-251-0441
 - 4. Pilkington North America / NSG Group: Toledo, OH 43604-5684, PH 419-322-4395

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with ANSI Z97.1 and CPSC 16 CFR 1201, Category II.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified in Product Schedule. Performance properties indicated in manufacturer's published test data based on procedures indicated below:
 - 1. U-Factors: Center-of-glazing values, according to NFRC 100 methodology and based on LBNL WINDOW 7 computer program, expressed as Btu/sq. ft. x h x deg F.
 - 2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 methodology and based on LBNL 35298 WINDOW 7 computer program.
 - 3. Solar Optical Properties: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to

authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

- C. Insulating-Glass Certification Program: Shall comply with ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation. Units shall be certified for compliance with the above ASTM test method and permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.
- C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- D. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (Heat-Strengthened), Condition B (spandrel glass, one surface coated), Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190 and certified for compliance by the IGCC.
 - 1. Unit overall thickness tolerance shall be -1/16-inch / +1/32-inch for a 1-inch two ply insulating unit. Unit constructed with laminated glass shall be +/- 1/16-inch tolerance.
 - 2. Shall comply with ASTM E 546 Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units.
 - 3. Shall comply with ASTM E 576 Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units in the Vertical Position.
 - 4. Sealing System: Dual seals compatible with one another and materials they contact.
 - 5. Spacer: Manufacturer's standard spacer material and construction.

2.6 LAMINATED GLASS

A. Interlayer

1. Basis of Design: Trosifol Security Interlayer as manufactured by Kuraray America, Inc. 3700 Bay Area Blvd., Suite 680, Houston, TX 77058 USA, PH: 800-423-9762. www.kuraray.us.com
2. Thickness: 2.28mm (90 mils)
3. Color: Clear.
4. Interlayer Physical Properties:
 - a. Young's Modulus: 43 kpsi, when tested in accordance with ASTM D5026.
 - b. Tensile Strength: 5.0 kpsi, when tested in accordance with ASTM D638.
 - c. Elongation: 400%, when tested in accordance with ASTM D638.
 - d. Flex Modulus: 50 kpsi, when tested in accordance with ASTM D790.
 - e. Heat Deflection Temperature at 0.46 MPa: 110 deg. F, when tested in accordance with ASTM D648.

2.7 FIRE PROTECTION RATED GLAZING

- A. General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire protection ratings indicated, based on positive pressure testing in accordance with NFPA 257 or UL 9, including hose stream test, and shall comply with NFPA 80.
- B. Fire Protection-Rated Tempered Glass - Clear: 6mm thickness; fire-protection-rated tempered glass; complying with 16 CFR 1201, Category II.

2.8 PRODUCT SCHEDULES

A. MONOLITHIC GLASS SCHEDULE – Refer to Drawings for coordination.

1. **SG1** - Interior glazing where indicated and not required to be safety glazing.
 - a. Glass Type: Clear annealed float glass.
 - b. Minimum Thickness: 1/4-inch unless noted otherwise on Drawings.
 - c. Safety glazing required.
 - 1) Fully tempered in locations required by applicable federal, state, and local codes and regulations or where indicated on drawings.
2. **SG2** - Interior glazing applications where safety glazing is required.
 - a. Glass Type: Clear fully tempered float glass.
 - b. Minimum Thickness: 1/4-inch.
 - c. Applications:
 - 1) Glazed lights in doors, except fire rated doors.
 - 2) Interior Swinging Glass doors and sidelights.
 - 3) Glazed sidelights to doors, except in fire-rated walls and partitions.
 - 4) Interior Entry and Cart Storage Room Glass partitions as per drawings.
 - 5) Other locations required by applicable federal, state, and local codes and regulations or where indicated on drawings.

3. **FR1** – For use at interior fire rated wall construction locations (Where applicable).

B. **INSULATING GLASS SCHEDULE** – Refer to Drawings for coordination.

1. **EG1** - Exterior Sliding and Swinging Glass door units and sidelights.
 - a. Glass Type: Low-E-coated, clear insulating glass.
 - b. Overall Unit Thickness: 1-inch.
 - c. Minimum Thickness of Each Glass Lite: 1/4-inch.
 - d. Outdoor Lite: Fully tempered float glass.
 - e. Interspace Content: Air or as required to meet IECC requirements.
 - f. Indoor Lite: Fully tempered float glass.
 - g. Low-E Coating: Sputtered on surface #2.
 - 1) Basis of Design: eXtraSelective SNX 62/27 on Clear.
 - a) Solarban 90 on Clear.
 - b) Pilkington Solar-E on Clear.
 - h. Safety glazing required.
2. **EG2** - Exterior glazing above Swinging and Sliding Glass door units.
 - a. Glass Type: Low-E-coated, tinted insulating glass.
 - b. Overall Unit Thickness: 1-inch.
 - c. Minimum Thickness of Each Glass Lite: 1/4-inch.
 - d. Outdoor Lite: Tinted annealed float glass.
 - 1) Tint Color: Guardian Clear.
 - e. Low-E Coating: Sputtered on surface #2.
 - 1) Basis of Design: SunGuard eXtraSelective SNX 62/27 on Clear.
 - a) Solarban 90 on Clear.
 - b) Pilkington Solar-E on Clear.
 - f. Interspace Content: Air or as required to meet IECC requirements.
 - g. Indoor Lite: Clear annealed float glass.

C. **IMPACT RATED INSULATED GLASS WITH LAMINATED GLAZING**

1. **EG3** - Exterior Laminated Spandrel Glass. For use in clerestory windows in parapet wall conditions and other locations as indicated on the drawings.
 - a. Glass Type: Clear Heat-Strengthened insulating glass.
 - b. Overall Unit Thickness: 1-inch minimum.
 - c. Outdoor Lite: Heat-Strengthened glass
 - 1) Thickness: 1/4-inch, Clear, Heat Strengthened
 - d. Interspace Content: Air or as required to meet IECC requirements.
 - e. Indoor Lite: Laminated Glazing as defined above
 - 1) Thickness: 1/4-inch, HT / 0.09-inch Trosifol / 1/4-inch, HT
 - 2) Spandrel Coating: Guardian HT Warm Gray on Surface #4 or Equal
2. **EG4** - Exterior Glazing Clerestory Units located at the sales floor area.
 - a. Glass Type: Low-E-coated, tinted, insulating glass.

- b. Overall Unit Thickness: 1-1/32-inch
- c. Outdoor Lite: Fully tempered float glass
 - 1) Thickness: 1/4-inch.
 - 2) Tint Color: Guardian CrystalGray.
 - 3) Low-E Coating: Sputtered on surface #2
 - a) Basis of Design: SunGuard eXtraSelective SNX 62/27
 - b) Solarban 90
 - c) Pilkington Solar-E - Grey
- d. Interspace Content: Air or as required to meet IECC requirements.
- e. Indoor Lite: Clear, Laminated Glazing as defined above
 - 1) Thickness: 3/16-inch HT / 0.09-inch Trosifol / 3/16-inch HT.

2.9 GLAZING SEALANTS

A. General:

- 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing, single component capable of water immersion, non-staining, non-bleeding silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use M, A, and G; cured Shore A, Hardness range of 15 to 25; color - clear.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Construction Chemicals-Building Systems.
 - b. Bostik, Inc.
 - c. Dow Corning Corporation.
 - d. Pecora Corporation.

C. Glazing Sealant: Chemical curing, single component, non-staining, non-bleeding polyurethane sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; Shore A, Hardness range of 20 to 35; color - black.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation-Construction Systems.
 - b. Bostik, Inc.
 - c. Dow Corning Corporation.
 - d. Pecora Corporation.

2.10 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.11 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Apply heel bead of elastomeric sealant.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets

and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation remove non-permanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

END OF SECTION 088000

SECTION 088700 – SUN CONTROL WINDOW FILM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sun Control Window Film:
 - 1. Clear micro-layered film.
 - 2. Block-out Window Film- for use at existing store windows which are required to have blackout film due to construction behind them.

1.2 RELATED SECTIONS

- A. Section 08800 - Glazing; general glazing applications to receive architectural window film.

1.3 REFERENCES

- A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.
- B. ASTM International (ASTM):
 - 1. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.
 - 3. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
- C. NFRC 100/200 (Formerly ASTM E903) - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
- D. Window 6.3 - A Computer Tool for Analyzing Window Thermal Performance; Lawrence Berkeley Laboratory.

1.4 DEFINITIONS

- A. Light to Solar Gain Ratio: The ratio of visible light transmission to Solar Heat Gain Coefficient.

1.5 PERFORMANCE REQUIREMENTS

- A. Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:
 - 1. Flame Spread Index: no greater than 25.
 - 2. Smoke Developed Index: no greater than 55.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's current technical literature on each product to be used, including:
 - 1. Manufacturer's Data Sheets.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- C. Verification Samples: For each film specified, two samples representing actual film color and pattern.
- D. Performance Submittals: Provide laboratory data of emissivity and calculated window U-Factors for various outdoor temperatures based upon established calculation procedure defined by the ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years' experience.
 - 1. Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
 - 1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
 - 2. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:
 - a. Name of building.
 - b. The name and telephone number of a management contact.
 - c. Type of glass.
 - d. Type of film and/or film attachment system.
 - e. Amount of film and/or film attachment system installed.
 - f. Date of completion.
 - 3. Provide an EFilm application analysis to determine available energy cost reduction and savings.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Follow Manufacturer's instructions for storage and handling.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.10 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
- B. In order to validate the warranty, installation must be performed by an Authorized 3M dealer and according to the Manufacturer's installation instructions. Verification of Authorized 3M dealer can be confirmed by submission of active 3M dealer code number.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers as follows:
- B. Sun Control Film: 3M Commercial Solutions, which is located at: 3M Center Bldg. 220-12-E-04; St. Paul, MN 55144-1000; Toll Free Tel: 888-650-3497; Tel: 651-737-1081; Fax: 651 737 8241; Email: 3mredinsidesales@mmm.com; Web: http://www.3m.com/3M/en_US/architectural-design-us/?utm_medium=redirect&utm_source=vanity-url&utm_campaign=www.3M.com/AMD|http://www.3m.com/3M/en_US/building-window-solutions-us
- C. Blockout Window Film: Solyx SX-3133 Dorian Gray Dusty Crystal.
 1. Applied to the exterior or interior as indicated on the drawings. 2mm thick vinyl with acid etched look. 60" width.
 2. Shading Coefficient: .22
 3. Visible Light Reflectance: 4%
 4. Visible Light Transmission: 3%
 5. UV Transmission: 0%
 6. Solar Heat Reflectance: 7%
 7. IR Transmission: 12%
 8. Solar Heat Absorbance: 27%

D. Substitutions: Not permitted.

2.2 3M PRESTIGE SUN CONTROL FILM

A. Physical Properties:

1. Composition: Optically clear polyester film containing at least 220 layers and incorporating pressure sensitive adhesive on one side and an acrylic abrasion resistant coating on the other. Nanotechnology represents a breakthrough in technology due to the enhanced heat, UV and IR rejection, without the presence of any metals. The film does not contain dyes.
2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Thickness: Nominal 2.0 mils (0.1 mm) with no evidence of coating voids.
5. Identification: Labeled as to Manufacturer as listed in this Section.

B. Performance, Prestige 70 - Clear Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4-Inch (6.4 mm) Thick Clear Glass:

1. Visible Light Transmission (NFRC 100/200, ASTM E 308): 69 percent
2. Visible Reflection - Exterior (NFRC 100/200): 9 percent.
3. Visible Reflection - Interior (NFRC 100/200): 9 percent.
4. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
5. Infrared Energy Rejected (NFRC 100/200): Up to 97 percent; as measured between 900-1000 nm.
6. Light to Solar Gain Ratio: 1.4.
7. Solar Heat Gain Coefficient (Normal Incidence) (NFRC 100/200): 0.50.
8. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 50 percent.
9. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 59 percent.

PART 3 EXECUTION

3.1 EXAMINATION

A. Film Examination:

1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
 - a. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.

3. Commencement of installation constitutes acceptance of conditions.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.3 INSTALLATION

- A. Film Installation, General:
 1. Install in accordance with manufacturer's instructions.
 2. Cut film edges neatly and square at a uniform distance of 1/8-inch (3 mm) to 1/16-inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
 3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
 4. Apply film to glass and lightly spray film with slip solution.
 5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
 6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
 7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
 8. If completing an exterior application, check with the manufacturer as to whether edge sealing is required.

3.4 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION 088700

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:** For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies:** For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General:** Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners:** ASTM C 645.
1. Steel Studs and Runners:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Dietrich Metal Framing.
 - 2) MBA Building Supplies.
 - 3) Steel Network, Inc. (The).
 - b. Minimum Base-Metal Thickness: As indicated on Drawings.

- c. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12-inches of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Firestop Tracks: (if and where indicated on Drawings) Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Fire Trak Corp.
 - b. Metal-Lite.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings.
- F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Clip Angle: Not less than 1-1/2-inches by 1-1/2-inches, 0.068-inch-thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: As indicated on Drawings.
 - 2. Depth: As indicated on Drawings.
- H. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical or hat shaped.

- I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329-inch.
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- J. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4-inches, wall attachment flange of 7/8-inch, minimum uncoated-metal thickness of 0.0179-inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
 - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16-inch in diameter.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538-inch and minimum 1/2-inch-wide flanges.
 - 1. Depth: As indicated on Drawings.
- E. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4-inch-deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8-inch-deep.
 - a. Minimum Base-Metal Thickness: As indicated on Drawings.

4. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch-thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
 1. Wall mounted cabinets.
 2. Plumbing fixtures.
 3. Toilet partitions.
 4. Toilet accessories.
 5. Wall mounted door hardware.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated on Drawings, but not greater than spacings required by referenced installation standards for assembly types.

- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- E. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Z-Shaped Furring Members:
 - 1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
 - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 - 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8-inch from the plane formed by faces of adjacent framing.

3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to the steel roof deck.
 - 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8-inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.
4. Texture finishes.
5. Penetration barrier security mesh.

1.2 ACTION SUBMITTALS

- A. Product Data:** For each type of product.
- B. Samples:** For each texture finish indicated on same backing indicated for Work.

1.3 WARRANTY

- A. Materials Warranty (Glass-Mat Gypsum Sheathing Board):** Provide sheathing manufacturer's standard warranty covering sheathing materials for five years commencing on date of purchase.
- B. Weathering Warranty (Glass-Mat Gypsum Sheathing Board):** Provide sheathing manufacturer's standard warranty covering in-place exposure damage to sheathing for six months commencing on date of purchase by contractor.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies:** For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. Underwriters Laboratories Fire Rated Assemblies (per U/L subject File #1857)** will not be jeopardized by using AMICO's Security Mesh in the fire rated assembly.

2.2 GYPSUM BOARD, GENERAL

- A. Size:** Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. CertainTeed Corporation.
 - c. Georgia-Pacific Gypsum.
 - d. National Gypsum Company.
 - e. Temple-Inland Inc.
 - f. USG Corporation.
 - g. Substitutions: Approved Equal.
2. Use for vertical surfaces.
3. Thickness: As indicated on drawings.
4. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Application: Use for vertical surfaces.
2. Thickness: 5/8-inch.
3. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Application: Ceilings, unless otherwise indicated.
2. Thickness: As indicated on drawings.
3. Long Edges: Tapered.
4. Special sag resistant.

D. Moisture & Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Application: Vertical surfaces behind thinset tile or FRP, and anywhere indicated on Drawings.
2. Thickness: 5/8-inch.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Georgia-Pacific Gypsum: DensGlass Gold Sheathing.
 - b. Substitutions not permitted.

2. Application: Exterior sheathing, unless otherwise indicated.
3. Core: As indicated.

B. Limitations:

1. Do not use Dens-Glass Gold sheathing as a base for nailing or mechanical fastening. Fasteners should be flush to the face of the board, not countersunk.
2. The use of forced air heaters creates volumes of water vapor which, when not properly vented, can condense on building materials. The use of these type heaters and any resulting damage is not the responsibility of G-P Gypsum. Consult heater manufacturer for proper use and ventilation. Avoid any condition that will create moisture in the air and condensation on the exterior walls during periods when the exterior temperature is lower than the interior.
3. When Dens-Glass Gold panels are used in slanted wall applications, that portion of the wall must be temporarily protected from the elements by the use of a weather barrier such as #15 felt prior to application of the cladding. Also, exposed wall ends such as may be found in parapets must be covered to prevent water from infiltrating the cavity.
4. G-P Gypsum does not warrant and is not responsible or liable for the performance of the cladding or exterior systems applied over Dens-Glass Gold sheathing. The suitability and compatibility of any system is the responsibility of the system manufacturer or design authority.
5. Do not laminate Dens-Glass Gold sheathing to masonry surfaces; use furring strips or framing spaced at manufacturer's specifications.
6. Dens-Glass Gold sheathing is not intended for tile applications. For tile applications, consult our Dens-Shield Tile Backer brochure.
7. Consultant manufacturer literature for additional material limitations and restrictions.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.

- c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Exterior Gypsum Soffit Board: Paper.
 - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- D. Joint Compound for Exterior Applications:
 - 1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

2.7 DRYWALL PENETRATION BARRIER SECURITY MESH

- A. Basis of Design: The behind-the-drywall penetration barrier system shall conform to Security Mesh™ and installed using Secura Clips as manufactured by ALABAMA METAL INDUSTRIES CORPORATION, (AMICO), 3245 Fayette Avenue; Birmingham, AL 35208; Telephone (800) 366-2642.
- B. Panels
 - 1. ASM 1.5–9F Medium Security
 - a. Mesh size opening – width 1.000-inch x 2.563-inch-long allowing 77 percent open area.
 - b. Mesh strand thickness– 0.110-inch
 - c. Weight– 1.11 lbs. per square foot mill finish
 - d. Security Mesh is produced in a standard 4-foot x 8-foot panel.

2. AMICO Secura Clips

- a. Security Mesh shall be attached to framing members using AMICO Secura Clips and the appropriate threaded fasteners.
 - 1) For steel framing install a flat head bugle type self-tapping fine thread screw long enough to penetrate the framing member a minimum of 3/8-inch.
 - 2) Standard Secura Clip spacing is a minimum of 12 inches vertically per framing member.

3. Finish

- a. A. Security Mesh to be "mill finish" HR P&O.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033- to 0.112-inch thick.
- C. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- E. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C 840.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide partition head slip track at these locations as shown on drawings. Trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- E. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: Walls and Ceilings that will be exposed to view unless otherwise indicated to receive paint finish or wall coverings.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - 4. Level 5: Walls and ceilings to receive semi-gloss or gloss paint treatment and other areas specifically indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- H. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- I. Penetration Barrier System installation:
 - 1. Security Mesh panels may be installed with diamond running in either direction.
 - 2. Mesh joints occurring on framing members may either join staggered or butt together. It is also acceptable to overlap mesh joints with owner's approval.
 - 3. Panels shall join on a framing member.
 - 4. Panels not joining on framing member shall be wire tied with 18GA steel tie wire. Wire tying shall be no less frequent than the installation of Secura Clips.

3.2 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical tiles and concealed suspension systems for ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.

2.2 ACOUSTICAL TILE CEILINGS, GENERAL

- A. Acoustical Tile Standard: Comply with ASTM E 1264.
- B. Metal Suspension System Standard: Comply with ASTM C 635.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Hold Down Clips and Accessories

2.3 ACOUSTICAL TILES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Armstrong World Industries, Inc: Cortega #769, mineral based, lay-in.
 - 2. USG Corporation: Radar 2310. www.usg.com

- B. Classification: Type III, Form 2, Pattern C D.
- C. Color: White.
- D. LR: 0.82.
- E. NRC: 0.55, Type E-400 mounting according to ASTM E 795.
- F. CAC: 35.
- G. Edge/Joint Detail: Square.
- H. Thickness: 5/8-inch.
- I. Modular Size: 24-inch by 48-inch.

2.4 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Armstrong World Industries, Inc.: Prelude XL, 15/16-inches, exposed T.
 - 2. USG Corporation: USG Donn Brand DX/DXL. www.usg.com.
- B. Structural Classification: Heavy-duty system.
- C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

2.5 HOLD DOWN CLIPS

- A. Manufactures: Armstrong
 - 1. Armstrong World Industries, Inc.: 414 Retention clip

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install acoustical tile ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.
- C. Arrange directionally patterned acoustical tiles as indicated on reflected ceiling plans.

END OF SECTION 095123

SECTION 096513 - RESILIENT BASE AND ACCESSORIES (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient Base.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: Submit two 12-inch-long samples of base material for each color specified.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Manufacturers: Subject to compliance with requirement, provide products by the following:

1. Tarkett Johnsonite, Contact: Paul Baker; 713-724-2812; email paul.baker@tarkett.com

B. Standards: ASTM F 1861 Type TP, Group 1.

C. Application:

1. Cove: Throughout Sales floor, Entry and Cart Storage at gypsum board finishes, back of house and hunting counter. Ref Drawings for locations.

D. Thickness: 0.125-inch.

E. Height: 4-inches.

F. Pre-molded inside and outside corners.

G. Colors: As scheduled on Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

- B. Do not install resilient products until they are the same temperature as the space where they are to be installed.

3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with substrates.
- D. Do not stretch resilient base during installation.
- E. Install pre-molded corners before installing straight pieces.

3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

END OF SECTION 096513

**SECTION 096816 – CARPETING
(PROVIDED AND INSTALLED BY ACADEMY’S CONTRACTORS)**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes Carpet Tiles.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Shop Drawings showing the extent of product, seam direction and accessories shall be submitted to Architect for approval prior to installation. Check pattern match, if any, for matching during installation and possible waste factors in ordering required amounts. Should also indicate columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required. Copy of approved shop drawings to be available on job site during installation.
- B. Floor schedule using same room designations indicated on Drawings.
- C. Product Data: For each type of product specified, describing physical and performance characteristics, sizes, patterns, colors available, and method of installation.
- D. Samples: For each exposed product and for each color and texture specified.
- E. Verification of reclamation and recycling program.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish 5-percent of amount installed for each type, color, pattern, and size specified.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. Company specializing in manufacturing specified carpet with minimum (15) fifteen years documented experience.
2. Upon request, manufacturer to provide representative to assist in project start-up and to inspect installation while in process and upon completion. Representative will notify designated contact if any installation instructions are not followed.
3. Single Source Responsibility: Obtain each type of product from one source and by a single manufacturer.

B. Installer Qualifications: An experienced Installer who is certified by the International Certified Floorcovering Installers Association and the Manufacturer prior to bid.

1. Floor contractor must be Academy Sports + Outdoors approved / Tandus certified.
 - a. Flooring contractor to be a specialty contractor normally engaged in this type of work and shall have prior experience in the installation of these types of materials.
 - b. Flooring contractor possessing Contract for the product installation shall not sub-contract the labor without written approval of the Project Manager.
 - c. Flooring contractor will be responsible for proper product installation, including floor testing and preparation as specified by the manufacturer and JOB CONDITIONS herein.
 - d. Flooring contractor to provide Owner a written installation warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of one year after job completion.

C. Fire-Test-Response Ratings: Where indicated, provide carpet and carpet cushion identical to those of assemblies tested for fire response per NFPA 253 by a qualified testing agency.

1.8 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

1.9 PRODUCT RECYCLABILITY AND RECYLING PROGRAM

A. Manufacturer must fully comply with the US Federal Trade Commissions' "Guides for the Use of Environmental Marketing Claims" (CFR Title 16 part 260) with respect to advertising, labeling, product inserts, catalogs, and sales presentations of all its flooring products submitted and sold.

B. Product must meet FTC Guides for recyclability and must be one hundred percent (100%) closed-loop recyclable back into flooring. A manufacturer cannot claim that a product or any portion of a product is recyclable if it is incinerated, even if incineration is used to produce heat and power (i.e., waste-to-energy) per FTC guides 16 CFR section 260.7 (d) example 3.

C. The recyclability of product installed must be the same as that claimed by manufacturer and required by Project requirements.

- D. Manufacturer must have a collection and recovery system for product and a fully established, currently operational recycling program at time of bid per FTC Guides Section 260.7 (d).
- E. Manufacturer must be able to reclaim and recycle 100% of installed carpet. Like material as installed must be 100% recycled.
- F. Manufacturer must have a written guarantee that 100% of the recovered vinyl backed carpet will be recycled and that no portion of the product will be land filled or incinerated (including waste-to-energy).

1.10 WARRANTY

- A. Warranty to be sole source responsibility of the Manufacturer. Second source warranties and warranties that involve parties other than the carpet manufacturer are unacceptable.
- B. If the product fails to perform as warranted when properly installed and maintained, the affected area will be repaired or replaced at the discretion of the Manufacturer.
- C. Chair pads are not required but are recommended for optimum textural performance. Absent the use of chair pads, more intensive maintenance will be required for areas in direct contact with chair caster traffic, and some degree of appearance change is to be expected.
- D. Warranty shall be for a specifically defined non-prorated period of (25) twenty-five years. Lifetime” warranties are not acceptable. More intensive maintenance will be required for product installed on stairs, and some degree of appearance change is to be expected.
- E. Warranty shall not exclude carpet product installed on stairs provided it is properly installed and maintained.
- F. The non-prorated (25) twenty-five years warranty shall specifically warrant against:
 - 1. Excessive Surface Wear: More than 15% loss of pile fiber weight
 - 2. Excessive Static Electricity: More than 3.0 kV per AATCC 134
 - 3. Resiliency Loss of the Backing: More than 10% loss of backing resiliency
 - 4. Delamination
 - 5. Edge Ravel
 - 6. Zippering
- G. Tuft Bind warranty in lieu of edge ravel and zippering is not acceptable.

1.11 DELIVERY, STORAGE, & HANDLING

- A. Deliver materials to the site in manufacturer's original packaging listing manufacturer's name, product name, identification number, and related information.
- B. Store in a dry location, between 60 degrees F and 80 degrees F and a relative humidity below 65%. Protect from damage and soiling. Stack carpet rolls horizontally on a flat surface, stacked no higher than two rolls.

- C. Make stored materials available for inspection by the Owner's representative.
- D. Store materials in the area of installation for a minimum period of 48 hours prior to installation.

1.12 PROJECT CONDITIONS

- A. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document and the Manufacturer's installation instructions.
- B. The maximum amount of moisture evacuation from the floor is 3.0 pounds per 1,000 square feet in 24 hours. The acceptable pH level of the substrate is between 7.0 and 9.0. Flooring contractor is responsible for floor testing.
- C. All material used in sub-floor preparation and repair shall be recommended by the carpet manufacturer and shall be chemically and physically compatible with the carpet system being bid.
- D. Maintain minimum 65 degrees F ambient temperature and 65% Relative Humidity for 72 hours prior to, during, and 48 hours after installation.
- E. Do not install flooring until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 CARPET

- A. Manufactured by Tarkett:
 - 1. Academy 1 Sports (Fitness Carpet) – Plexus Colour IV – ~~GREAT LAKES 18548~~
26202 STEEL WORK:
 - a. Type of product: Textile Flooring, 24-inch x 24-inch Tiles
 - b. Pattern: Plexus Colour IV 02875
 - c. Installation Pattern: Quarter Turn.
 - d. Commercial warranty: Lifetime Limited
 - e. Flammability: Class 1
 - f. Smoke density: 450 or less
 - g. Surface treatment: Eco-Ensure (fluorine-free soil protection)
 - h. Installation method: Glue down
 - i. Pattern type: Allover
 - j. Construction: Symtex
 - k. Soil protection: Application rate: 2% of face weight
 - l. Pile construction: Cut-and-loop pile.
 - m. Surface Flammability: Meets CAN/CGSB-4.2 No. 27.6/DOC FF 1-70
 - n. Electrostatic Propensity: < 3.0 kV

- o. Gauge: 1/13-inch
- p. Colorfastness to light: >4 after 60 hours
- q. Stitches/Rows per inch: 12/in
- r. Pile Thickness: 0.085-inch (2.11mm)
- s. Fiber System: Dynex SD Nylon
- t. Dye Method: Solution dyed / Yarn dyed
- u. Secondary backing: ethos Modular with Omnicoat technology
- v. Primary backing: Synthetic Non-Woven
- w. Face weight: 24 oz / square yard
- x. CRI Green Label Plus Certification: GLP8320
- y. Recycled Content – Production Waste: 22%
- z. Third Party Certification NSF-140: Platinum
- aa. Antimicrobial Chemicals: No antimicrobials (EPA registered pesticides) added to product
- bb. Post Consumer recycled content: 33%
- cc. Total Recycled Content (based on total weight: 8.7%.
- dd. Environmental Impact: No pesticides added to product (US EPA Registered Antimicrobials).

2. Substitutions/Alternates:

- a. No substitutions or alternates.

2.2 CARPET PERFORMANCE CHARACTERISTICS

- A. Test reports for the following performance assurance testing to be submitted upon request.
- B. Submitted results shall represent average results for production goods of the referenced style.
- C. Requirements listed below must be met by all products.
 - 1. Flooring Radiant Panel:
 - a. ASTM E-648 / NFPA 253: Class 1 (CRF: 0.45 watts/sq cm or greater).
 - 2. Federal Flammability:
 - a. CPSC FF 1-70: Passes.
 - 3. Smoke Density:
 - a. ASTM E-662 / NFPA 258: < 450 Flaming Mode.
 - 4. Electrostatic Propensity:
 - a. AATCC 134 (Step & Scuff): 3.0 kV or less.
 - 5. Static Coefficient of Friction:

- a. ASTM C-1028: Passes ADA Requirements for Accessible Routes (minimum 0.60).
- 6. Delamination of Secondary Backing of Pile Floor Coverings:
 - a. ASTM D-3936: No Delamination.
- 7. Lightfastness:
 - a. AATCC 16E: > 4 @ 100 hours.
- 8. Vetterman Drum:
 - a. ASTM D-5417: Minimum 3 @ 22,000 cycles.
- 9. Moisture Barrier:
 - a. Moisture Penetration by Impact @ 10 psi: No penetration of backing and seam after 10,000 impacts.
- 10. Air Flow Barrier:
 - a. Air Permeability of Textile Fabrics: No Air Flow (0.0 cu. ft/min) through backing and seam.
- 11. Seam Integrity:
 - a. Seam to remain intact after 50,000 cycles per Phillips Chair Test.

2.3 INSTALLATION ACCESSORIES

- A. Adhesives: Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.
- B. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- C. Base, Carpet Edge and Transitions strips: As specified in applicable sections.
 - 1. Transition at Carpet Areas: Schluter VINPRO U VPU50ACG 3/16" (brushed aluminum) at Fitness Area carpet, as indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and

other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.

- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.
- C. Fill all depressions, cracks, and other surface irregularities with a good quality portland cement-based underlayment patching compound appropriate for this purpose. Refer to section 035413.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Preparation: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
- F. Installation: Comply with CRI 104 and carpet and carpet cushion manufacturers' written installation instructions for the following:
 - 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
 - 2. Double-Glue-Down Installation: Comply with CRI 104, Section 10, "Double-Glue-Down Installation."
 - 3. Carpet with Attached-Cushion Installation: Comply with CRI 104, Section 11, "Attached-Cushion Installations."
 - 4. Preapplied Adhesive Installation: Comply with CRI 104, Section 11.4, "Pre-Applied Adhesive Systems (Peel and Stick)."
 - 5. Hook-and-Loop Installation: Comply with CRI 104, Section 11.5, "Hook and Loop Technology."
 - 6. Stretch-in Installation: Comply with CRI 104, Section 12, "Stretch-in Installations."
- G. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
- H. Do not bridge building expansion joints with carpet.
- I. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- J. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- K. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- L. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

- M. Comply with carpet cushion manufacturer's written recommendations. Install carpet cushion seams at 90-degree angle with carpet seams.
- N. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- O. Protect installed carpet to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 096816

SECTION 097200 - WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall covering and borders.

1.02 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Preparation and priming of substrate surfaces.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- B. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2020.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Samples: Submit two samples of wall covering, 4 by 4 inch in size illustrating color, finish, and texture.
- C. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 WALL COVERINGS

- A. Wall Covering - Type WP-2: Expanded PVC.
 - 1. Trim: Manufacturer's standard trim shapes; refer to drawings.
 - 2. Color: refer to drawings.
 - 3. Pattern: refer to drawings.
 - 4. Surface Texture: refer to drawings.
 - 5. Manufacturers:
 - a. Hanglock; www.hanglock.com.
- B. Wall Covering - Type WP-3: Expanded PVC.
 - 1. Trim: Manufacturer's standard trim shapes; refer to drawings.
 - 2. Color: refer to drawings.
 - 3. Pattern: refer to drawings.
 - 4. Surface Texture: refer to drawings.

- 5. Manufacturers:
 - a. Hanglock; www.hanglock.com.
- C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- D. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

- A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
- B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- D. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- C. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

- A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system (2 samples each) and each color and gloss (2 samples each) of topcoat.
- C. Product List: For each product indicated.

1.4 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: Furnish 1 gal. (7.6 L) of each material and color applied.
 - 2. Label each container with color, type, texture, and room locations in addition to the manufacturer's label.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product listed below:
 - 1. Acceptable Manufacturer's: Sherwin-Williams, No Substitutions.
 - 2. Contact: Mike Koncilja prior to painting for National Account information:
 - a. Mike Koncilja
 - b. National Accounts
 - c. The Sherwin-Williams Company
 - d. Office: 602-653-9577
 - e. michael.j.koncilja@sherwin.com
 - 3. Proper procedures must be followed by the contractor prior to, during and after painting so that Sherwin-Williams may provide warranty coverage for exterior coatings. Failure to follow these procedures may result in refusal of warranty. (Academy National Patent #2021)

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

- C. Colors: As indicated in Room Finish Schedule and Exterior Elevations on Drawings.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior.

2.4 PRIMERS/SEALERS

- A. Primer, Alkali Resistant, Water Based.
- B. Primer, Bonding, Water Based.
- C. Primer, Bonding, Solvent Based.
- D. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.

2.5 METAL PRIMERS

- A. Primer, Alkyd, Anti-Corrosive for Metal.
- B. Primer, Alkyd, Quick Dry, for Metal.
- C. Primer, Galvanized, Water Based.
- D. Primer, Galvanized: As recommended in writing by topcoat manufacturer.
- E. Primer, Quick Dry, for Aluminum.

2.6 WOOD PRIMERS

- A. Primer, Latex for Exterior Wood.
- B. Primer, Alkyd for Exterior Wood.
- C. Primer, Oil for Exterior Wood.

2.7 WATER-BASED PAINTS

- A. Latex, Exterior Flat (Gloss Level 1).
- B. Latex, Exterior Semi-Gloss (Gloss Level 5).
- C. Latex, Exterior, Gloss (Gloss Level 6).
- D. Light Industrial Coating, Exterior, Water Based (Gloss Level 3).
- E. Light Industrial Coating, Exterior, Water Based, Semi-Gloss (Gloss Level 5).
- F. Light Industrial Coating, Exterior, Water Based, Gloss (Gloss Level 6).

2.8 SOLVENT-BASED PAINTS

- A. Alkyd, Exterior Flat (Gloss Level 1).
- B. Alkyd, Exterior, Semi-Gloss (Gloss Level 5).
- C. Alkyd, Exterior Gloss (Gloss Level 6).
- D. Alkyd, Quick Dry, Semi-Gloss (Gloss Level 5).
- E. Alkyd, Quick Dry, Gloss (Gloss Level 7).

2.9 TEXTURED AND HIGH-BUILD COATINGS

- A. Primer for Textured Coating, Latex, Flat: As recommended in writing by topcoat manufacturer.
- B. Intermediate Coat for Textured Coating, Latex, Flat: As recommended in writing by topcoat manufacturer.
- C. Textured Coating, Latex, Flat.
- D. Primer for Latex, Exterior, High Build: As recommended in writing by topcoat manufacturer.
- E. Intermediate Coat for Latex, Exterior, High Build: As recommended in writing by topcoat manufacturer.
- F. Latex, Exterior, High Build.

2.10 FLOOR COATINGS

- A. Sealer, Water Based, for Concrete Floors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12-percent.
 - 2. Masonry (Clay and CMU): 12-percent.
 - 3. Wood: 15-percent.
 - 4. Portland Cement Plaster: 12-percent.
 - 5. Gypsum Board: 12-percent.

- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Where applicable, remove hardware, covers, plates and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completion of painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
 - 2. Masonry Substrates: Remove efflorescence and chalk where required prior to painting.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Pavement markings:

1. Refer to Spec Section 027650 for pavement marking products, colors and locations.
- B. Tilt-Up Concrete Panels: Power wash all exterior surfaces clean of any chemical or dirt before applying textured coating. Concrete panels shall be approved ready for painting by a representative of Sherwin-Williams. A Letter of Acceptance shall be submitted to the Contractor and Architect after approval.
 1. One Coat: A24W8300 Loxon® Concrete & Masonry Interior/Exterior Primer. (Tinted to closely match topcoat)
 2. One Coat: A44W811 UltraCrete WB Texture Coating Medium, using the color scheme as noted on the Drawings. (12-mils wet)
- C. EIFS: Omit texture coating at EIFS finish on building exterior per drawings. Coat as follows:
 1. One Coat: A24W8300 Loxon® Concrete & Masonry Interior/Exterior Primer. (Tinted to closely match topcoat)
 2. Two Coats: B66W300 Series Sher-Cryl HPA High Performance Acrylic, Semi-Gloss, using the color as noted on the drawings (12-mils wet)
- D. Steel – Unprimed:
 1. One Coat: B66W310 Pro Industrial Pro-Cryl® Universal Primer. (Tinted to closely match topcoat)
 2. Two Coats: B66W300 Series Sher-Cryl HPA High Performance Acrylic, Semi-Gloss. (12-mils wet)
- E. Steel – Shop Primed:
 1. Touch-up with B66W310 Pro Industrial Pro-Cryl® Universal Primer. (Tinted to closely match topcoat)
 2. Two Coats: B66W300 Series Sher-Cryl HPA High Performance Acrylic, Semi-Gloss. (12-mils wet)
- F. Steel - Galvanized:
 1. One Coat: B66W310 Pro Industrial Pro-Cryl® Universal Primer. (Tinted to closely match topcoat)
 2. Two Coats: B66W300 Series Sher-Cryl HPA High Performance Acrylic, Semi-Gloss. (12-mils wet)
- G. Aluminum - Mill Finish:
 1. One Coat: B66W310 Pro Industrial Pro-Cryl® Universal Primer. (Tinted to closely match topcoat)
 2. Two Coats: B66W300 Series Sher-Cryl HPA High Performance Acrylic, Gloss. (12-mils wet)
- H. Exterior Soffit Board:

1. One Coat: B57-620 S-W PrepRite ProBlock Exterior Latex Primer. (Tinted to closely match topcoat)
 2. Two Coats: A6W151 A-100® Exterior Latex Flat. (8-mils wet)
- I. Light Poles:
1. One Coat: B66W310 Pro Industrial Pro-Cryl® Universal Primer (Gray) (5-10 mils wet)
 2. Two Coats: B66W300 Series Sher-Cryl HPA High Performance Acrylic, Semi-Gloss, using the color as noted on the drawings. (12-mils wet)
- J. Exterior Schedule Listed on Drawings (See Drawings for Verification)

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system (2 samples each) and in each color and gloss (2 samples each) of topcoat.
- C. Product List: For each product indicated.

1.4 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: Furnish 1 gal. (7.6 L) of each material and color applied.
 - 2. Label each container with color, type, texture, and room locations in addition to the manufacturer's label.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product listed below:
 - 1. Acceptable Manufacturer's: Sherwin-Williams, No Substitutions.
 - 2. Contact: Mike Koncilja prior to painting for National Account information:
 - a. Mike Koncilja
 - b. National Accounts
 - c. The Sherwin-Williams Company
 - d. Office: 602-653-9577
 - e. michael.j.koncilja@sherwin.com
 - 3. Proper procedures must be followed by the contractor prior to, during and after painting so that Sherwin-Williams may provide warranty coverage for coatings. Failure to follow these procedures may result in refusal of warranty. (Academy National Patent #2021)

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As indicated in Room Finish Schedule on Drawings and listed in Schedule below.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior.

2.4 PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior.
- B. Primer, Alkali Resistant, Water Based.
- C. Primer Sealer, Interior, Institutional Low Odor/VOC.
- D. Primer, Latex, for Interior Wood.
- E. Primer Sealer, Alkyd, Interior.
- F. Primer, Bonding, Water Based.
- G. Primer, Bonding, Solvent Based.
- H. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based.
- B. Primer, Alkyd, Anti-Corrosive, for Metal.
- C. Primer, Alkyd, Quick Dry, for Metal.
- D. Primer, Galvanized, Water Based.
- E. Primer, Vinyl Wash.
- F. Primer, Quick Dry, for Aluminum.

2.6 WATER-BASED PAINTS

- A. Latex, Interior, Flat, (Gloss Level 1).
- B. Latex, Interior, (Gloss Level 2).
- C. Latex, Interior, (Gloss Level 3).
- D. Latex, Interior, (Gloss Level 4).
- E. Latex, Interior, Semi-Gloss, (Gloss Level 5).
- F. Latex, Interior, Gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees).
- G. Latex, Interior, Institutional Low Odor/VOC, Flat (Gloss Level 1).

- H. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 2).
- I. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 3).
- J. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5).
- K. Latex, Interior, High Performance Architectural, (Gloss Level 2).
- L. Latex, Interior, High Performance Architectural, (Gloss Level 3).
- M. Latex, Interior, High Performance Architectural, (Gloss Level 4).
- N. Latex, Interior, High Performance Architectural, Semi-Gloss (Gloss Level 5).
- O. Light Industrial Coating, Interior, Water Based (Gloss Level 3).
- P. Light Industrial Coating, Interior, Water Based, Semi-Gloss (Gloss Level 5).
- Q. Light Industrial Coating, Interior, Water Based, Gloss (Gloss Level 6).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12-percent.
 - 2. Masonry (Clay and CMU): 12-percent.
 - 3. Wood: 15-percent.
 - 4. Gypsum Board: 12-percent.
 - 5. Plaster: 12-percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. Wood – Painted:
 - 1. One Coat: 551-620 S-W PrepRite ProBlock Primer. (Tinted to closely match topcoat)
 - 2. Two Coats: B31-2600 S-W ProMar 200 Zero VOC Latex Semi-Gloss. (Tinted to closely match topcoat)
- B. Concrete:
 - 1. One Coat: A24W01100 Loxon® Conditioner Guide-Coat White Primer. (Tinted to closely match topcoat)
 - 2. Two Coats: B31W02651 ProMar® 200 Interior Latex, Semi-Gloss. (8-mils wet)
- C. Steel - Unprimed:
 - 1. One Coat: B66W01310 Pro Industrial Pro-Cryl® Universal Primer. (Tinted to closely match topcoat)
 - 2. Two Coats: B34W08251 ProMar® 200 Interior Alkyd, Semi-Gloss. (8-mils wet)

D. Steel - Primed:

1. Touch-up with B66W01310 Pro Industrial Pro-Cryl® Universal Primer. (Tinted to closely match topcoat)
2. Two Coats: B34W08251 ProMar® 200 Interior Alkyd, Semi-Gloss. (8-mils wet)

E. Steel - Galvanized:

1. One Coat: B66W01310 Pro Industrial Pro-Cryl® Universal Primer. (Tinted to closely match topcoat)
2. Two Coats: B34W08251 ProMar® 200 Interior Alkyd, Semi-Gloss. (8-mils wet)

F. Steel Roof Deck and Exposed Steel Roof Framing:

1. One Coat: B66W01310 Pro Industrial Pro-Cryl® Universal Primer. (Tinted to closely match topcoat).
2. Option A: Two Coats: B42T00081 Pro Industrial Waterborne Acrylic Dryfall:
 - a. Color: Tricorn Black SW#6258 (At existing stores where the entire ceiling at the Sales Area will be painted).
3. Option B: Two Coats: B42T00081 Pro Industrial Waterborne Acrylic Dryfall:
 - a. Color: To match existing (At existing stores where only part of the Sales Area ceiling is to be painted).
4. Note: At new stores the dryfall paint system is not required as roof framing and metal deck will be pre-finished by the manufacturer.
5. Note: Fall of 10'-0" of height is required for paint to dry during installation.
6. Note: Refer to Finish Schedule for bottom line height of ceiling paint at full height walls.

G. Aluminum - Mill Finish:

1. One Coat: B66W01310 Pro Industrial Pro-Cryl® Universal Primer. (Tinted to closely match topcoat)
2. Two Coats: B34W08251 ProMar® 200 Interior Alkyd, Semi-Gloss. (8-mils wet)

H. Gypsum Board SALES FLOOR:

1. One Coat: B28W2600 ProMar® 200 Interior Latex Primer. (Tinted to closely match topcoat)
2. Two Coats: B20-2600 ProMar® 200 Interior Latex, Eggshell. (8-mils wet)

I. Gypsum Board BACK OF HOUSE:

1. One Coat: B28W2600 ProMar® 200 Interior Latex Primer. (Tinted to closely match topcoat)
2. Two Coats: B31-2600 ProMar® 200 Interior Latex, Semi-Gloss. (8-mils wet)

J. Gypsum Board CEILINGS:

1. One Coat: B28W2600 ProMar® 200 Interior Latex Primer. (Tinted to closely match topcoat)
2. Two Coats: B30-2600 ProMar® 200 Interior Latex, Flat. (8-mils wet)

K. CMU - Acrylic Finish at Walls:

1. One Coat: Pro Industrial Heavy Duty Block Filler - B42W00150-20 or LX01W0200 Loxon Block Surfer or S-W PrepRite Block Filler B25W25.
2. Two Coats: B31-2600 ProMar® 200 Interior Latex, Semi-Gloss. (8-mils wet)

L. Interior Schedule as Listed On Drawings (see Drawings for Verification).

END OF SECTION 099123

SECTION 101440 - PLASTIC SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Room-identification signs.
 - 2. Instructional signs.
 - 3. Exterior Camera Surveillance Signs.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples: Provide two full sized sample signs illustrating size, type, style, color and lettering font for signs specified.
- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 REGULATORY REQUIREMENTS

- A. Conform to the American With Disabilities Act (ADA) (P.L. 101-336). Conform to all other federal, state, county, and local codes with jurisdiction that addresses handicapped accessibility.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install signs when ambient temperature is below 70 degrees F. Maintain this minimum during and after installation of signs.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 SIGNS

- A. Panel (Instructional) Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, 1/2-inch radiused corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: ASI Sign Systems, Inc.
2. Solid-Sheet Sign: Acrylic sheet, .080-inch-thick, size as indicated in Schedule, with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:
 - a. Surface-Applied Graphics: Permanently applied acrylic lettering and symbols.
3. Mounting: Surface mounted to wall with two-face tape or as indicated in Schedule.
4. Surface Finish and Applied Graphics:
 - a. Integral Acrylic Sheet Color: Academy (Royal) Blue.
 - b. Lettering Type: 1/32-inch thick, cut acrylic letters; permanently applied to sign face.
 - c. Letter Style: Optima Bold; provide Grade 2 Braille characters mounted below lettering.
 - d. Lettering and symbol size: 1-inch-high room numbers, 5/8-inch-high room names.
 - e. Letter Color: White unless indicated otherwise.

- B. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: ASI Sign Systems, Inc.
2. Alternate Sign Manufacturers
 - a. Inpro Architectural Products – www.inprocorp.com
 - b. Mohawk Sign Systems – www.mohawksign.com
3. Solid-Sheet Sign: Acrylic sheet, .080-inch-thick, size as indicated in Schedule, with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:
 - a. Surface-Applied Graphics: Permanently applied acrylic lettering and symbols.
4. Mounting: Surface mounted to wall two-face tape.

5. Surface Finish and Applied Graphics:

- a. Integral Acrylic Sheet Color: Academy (Royal) Blue.
- b. Lettering Type: 1/32-inch thick, cut acrylic letters; permanently applied to sign face.
- c. Letter Style: Optima Bold; provide Grade 2 Braille characters mounted below lettering.
- d. Lettering and symbol size: 1-inch-high room numbers, 5/8-inch-high room names.
- e. Letter Color: White unless indicated otherwise.

2.3 PANEL-SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, Type UVF (UV filtering).

2.4 ACCESSORIES

- A. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - a. Door Installation: Install after door surfaces are finished, centered on door surface, in locations/heights indicated.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Mounting Methods:
 - 1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position and push to engage tape adhesive.

- C. Remove temporary protective coverings and strippable films as signs are installed. Clean and polish per manufacturer's recommendations.

3.2 SCHEDULE (**Verify All Sign Quantities**)

- A. Provide five (5), 6-inch x 6-inch Instructional Signs; labeled "EMPLOYEES ONLY"; wall mounted as indicated on Drawings.
- B. Provide one (1), 10-inch x 10-inch Instructional Sign; labeled "RESTROOMS"; wall mounted as indicated on Drawings.
- C. Provide one (1) each, 6-inch-wide x 3-inch-high, Room Identification Signs for each room, except Sales Area. See floor plan for room names. Mount as indicated on Drawings.
 - 1. Provide signage per IFC-509.1 and IFC 605.3.1
- D. Provide one (1), 6-inch-wide x 8-inch-high, Room Identification Signs for each Toilet and Restroom, "MEN" or "WOMEN" as required (see floor plan), including international symbol of accessibility for signs that will be mounted on the doors of accessible Toilets and Restrooms. Mount as indicated on Drawings.
- E. Provide Exterior Camera Surveillance Signs for Parking lot (Quantity & Location to be verified).
- F. Provide Exit Instructional Signs labeled "EXIT" at all Exit Doors and any corridor leading to an exit.

END OF SECTION 101440

SECTION 102113- POWDER COATED TOILET COMPARTMENTS (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes powder coated toilet compartments configured as toilet enclosures and urinal screens.

1.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings from an applicable testing agency.
 - 1. Flame-Spread Index: 75 or less.
 - 2. Smoke-Developed Index: 450 or less.

1.3 REFERENCE STANDARDS

- A. Regulatory Requirements: Comply with applicable provisions.
 - 1. Americans with Disabilities (ADA) Standards for Accessible Design.
 - 2. ANSI A117.1 – American National Standard for Buildings and Facilities.
 - 3. ASTM A526 – Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.

1.3 ACTION SUBMITTALS

- A. Submittal Procedures: Unless indicated otherwise herein, submit in accordance with procedures specified in Section 013300.
- B. Product Data: Manufacturer name, color, finishes and installation directions for each type of product.
- C. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachment details from Manufacturer.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.4 QUALITY ASSURANCE

- A. Products and installation shall comply with current ADA Standards, ICC ANSI 117.1, and local requirements.

1.5 CLOSE OUT SUBMITTALS

- A. Maintenance data.
- B. Reference Specification Section 017700 for Closeout Procedures.

1.6 REQUIRED VENDOR

- A. Refer to Drawings for list of Owner's Required Vendors

PART 2 - PRODUCTS

2.1 POWDER COATED TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flush Metal Partition, LLC, Melville, NY 11747, 631-768-8301.
 - 2. No substitutions.
- B. Toilet-Enclosure Style: Flushite: Floor Mounted-Overhead braced.
- C. Urinal-Screen Style: Flushite: Floor Mounted-Wall braced.
- D. Door, Panel, and Screen Materials and Construction:
 - 1. Material: 22 gauge bonderized galvanized steel.
 - 2. Core Material: Sound deadening honeycomb core.
 - 3. Thickness: 1-inch
 - 4. Door edges shall be welded at intervals around perimeter. Corners shall be welded and ground smooth.
- E. Pilaster Materials and Construction:
 - 1. Material: 20-gauge bonderized galvanized steel
 - 2. Core Material: Sound deadening honeycomb core.
 - 3. Thickness: 1-1/4-inch (32 mm)
 - 4. Edges shall be welded at intervals around perimeter to insure rigid unit. Edges to be interlocked with an oval molding.
 - 5. Pilasters to have a jack leveling screw to provide a secure mechanical anchorage to the floor and to be fastened with 1-1/4-inch (32 mm) bolts and shields.
 - 6. Aluminum head rail to be capped on pilasters.
 - 7. All pilasters to have a 3-inch (76.2 mm) high, #4 finish stainless steel shoe.
- F. Powder Coated Baked Enamel Finish: One color for both Men's and Women's restrooms.
 - 1. Color: #639 Sapphire Blue

2.2 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
 - 1. All compartments provided are to be complete with hardware and fastenings necessary for complete installation.

2. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
3. Compliance: Operating force of less than 5 lb. (2.25 kg).
4. Emergency Access: All doors/hardware to be provided with emergency access features.
5. Materials: Zamac Chrome plated, unless otherwise indicated.
6. Doorstops: Provide and install to prevent in-swinging doors from swinging out beyond stile. Provide and install to prevent out-swinging doors from swinging in beyond stile.
7. Clothes Hooks: Projecting no more than 1-1/8-inch (29 mm) from face of door at inside of each stall. Center hooks on doors. Mount at 48 inches AFF per ADA requirements at all accessible stalls. All other stalls mount at 60 inches AFF.
8. Door Hardware Type:
 - a. Institutional Hardware
 - 1) Latching:
 - a) Concealed latch with emergency access feature.
 - b) ADA compliant concealed latch with emergency access feature at accessible stalls.
 - 2) Door Pull:
 - a) ADA compliant door pull to be placed on both sides of the door at all accessible stalls. Pull to be placed at a minimum of 34 inches AFF to the bottom of the pull or at a maximum of 48 inches AFF to the top of the pull on the latch side of the door per ADA requirements.
 - 3) Hinges: Wrap around hinges.
 - a) Lower hinge to be recessed in the door and shall operate on an opposing nylon cam.
 - b) Upper hinge to be recessed in the door and shall operate on a pin anchored above and below the hinge bracket.
9. No-Sight Privacy Channel:
 - a. Institutional Hardware
 - 1) Continuous stop and hinge side filler: 52-1/2-inches high; Aluminum; to be used at latch and hinge sides of doors; install as per manufacturer's recommendations to provide total privacy at door gaps.
10. Fittings:
 - a. Materials: aluminum.
 - b. Institutional Hardware

- 1) Continuous "U" Channel-Brackets: 1-inch by 57-inches; to be used to secure panels to pilasters.
 - 2) Continuous One Ear Brackets: 1-inch by 57-inches; to be used to secure end panels to wall or pilaster to panel.
 - 3) Continuous Two Ear or Double Ear Brackets: 1-inch by 57-inches; to be used to secure panels to wall.
 - 4) Continuous Two Ear or Double Ear Brackets: 1-inch by 41-inches; to be used to secure urinal screen panels to wall.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish.

2.3 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated on drawings. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Floor Mounted-Overhead Braced Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with jack leveling screws, 1-1/4-inch (32 mm) bolts and shields. Provide 3-inch (76.2 mm) high, #4 finish stainless steel shoes at each pilaster. Provide continuous aluminum headrail to be capped on pilasters and extend to the walls for bracing.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2-inch.
 - b. Panels and Walls: 3/4-inch.
 - c. Doors and Panels: 3/16-inch.
 2. Continuous Wall Brackets: Secure panels to pilasters as per manufacturers recommendations. Secure pilasters to floor and walls as per manufacturers recommendations.
 - a. Locate wall bracket fasteners so holes for wall anchors occur in tile joints if possible.
 - b. Align brackets at pilasters and panels with brackets at walls.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102800 - TOILET ACCESSORIES (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Warm-air dryers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Toilet Tissue (Roll) Dispenser
 - 1. Product: Surface mounted vertical – Georgia Pacific Compact #56782.
 - 2. Description: Vertical double-roll tissue dispenser.
 - 3. Color: Stainless.
 - 4. Mounting: Surface mounted.

B. Waste Receptacle:

1. Product (basis of design): Bobrick B-35643
2. Description: Recessed waste bin with 9.2-gal capacity.
3. Finish: Satin-finish Stainless Steel.
4. Mounting: Recessed flush mounted.

Alternate Selection:

5. Product: Bradley 3157, option 10.07.
6. Description: Recessed waste bin with 9.2-gal capacity.
7. Finish: Satin-finish Stainless Steel.
8. Mounting: Recessed flush mounted.

C. Toilet Seat Cover Dispenser:

1. Product: Krystal BWKKD200 Dispenser #818819
2. Description: 2 sleeve capacity toilet seat cover dispensers.
3. Finish: Chrome
4. Mounting: Surface mounted.

D. Grab Bar:

1. Product: WingIts Premium Stainless-Steel Grab Bars: WGB6SS18, WGB6SS36 and WGB6SS42.
2. Mounting: Flanges with concealed fasteners.
3. Material:
 - a. Mounting Flanges:
 - 1) 3-inch diameter, 3/32-inch-thick stainless steel, HeliArc welded to the tubing.
 - 2) Attach to adequate blocking per manufacturers recommendations.
 - b. Flange Covers:
 - 1) 3-inch diameter, 3/8-inch high, 22-gauge, drawn stainless steel snap on flange covers
 - c. Tubing:
 - 1) 1-1/2-inch outside diameter, 18-gauge Stainless-Steel tubing.
 - 2) Length: 18-inch, 36-inch and 42-inch, ref plans for location of sizes.
 - 3) Configuration: Straight.
4. Finish: Smooth satin finish

E. Sanitary-Napkin Disposal Unit:

1. Product: Bobrick, B-270.
2. Mounting: Surface mounted.
3. Door or Cover: Flip up cover.

4. Material and Finish: 18-8 Type 304, 22-gauge stainless steel with satin finish.

2.2 WARM-AIR DRYERS

A. Electric Hand Dryers:

1. Product: American Dryer, LLC, eXtremeAir GXT-ACDMT.
2. Cover Material and Finish: – One piece, vandal resistant, steel, white epoxy finish.
3. Mounting: Surface mounted.
4. Adjustable Speed: 10+ seconds.
5. Adjustable Sound Level: 83-69 dBA
6. Electrical Rating: 150 watts, universal voltage (110-120 / 208 / 220-240 VAC 60 Hz)
7. Motor: Universal type, through-flow discharge vacuum type with automatic resetting thermostat; 5/8 HP, 24,000 RPM.
8. Air Flow: 68 CFM at 216 mph (19,000 LFM) – CFM at 114 mph (10,000 LFM)
9. Electronic Controls: Automatic infrared optical sensor. Operates while hands are under blower. Shut-off within 3 seconds when hands removed, or in 35 seconds if hands not removed. Variable speed control to customize air performance / dry time, energy efficiency, sound level and user comfort as desired.
10. Heater: Nichrome wire element mounted inside plenum housing with automatic resetting thermostat to open when air flow is restricted and close when air flow is resumed. Heated air temperature is 135°F at an ambient of 72°F.
11. Warranty: 5 YR Limited

2.3 MIRRORS

A. Surface Mounted Mirrors:

1. Product: MEEK Mirrors, MPE 90x48, M1510 (60x48), M1510 (30x48), M1510 (90x40).
2. 22 gauge type 304 stainless steel in bright

2.4 CHILDCARE ACCESSORIES

A. Baby-Changing Station:

1. Product: Foundations Worldwide Inc., Baby Changing Station, 100-EH.
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection safety strap and two hooks for bags or purses.
 - a. Engineered to support a minimum of 250-lb static load when opened.
3. Mounting: Surface, with unit projecting not more than 4 inches from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: HDPE with steel-to-steel support hinges.
6. Color: Light Gray.
7. Liner Dispenser: Built in.

2.5 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six (6) keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturers. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.
- C. Baby-Changing Station: Install to withstand a downward load of 250 lbs. per requirements of ASTM F2285. Provide wall blocking as required per manufacturer's recommendations and located to meet ADA mounting height & clearance requirements.

END OF SECTION 102800

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**SECTION 104400
FIRE PROTECTION SPECIALTIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; Current Edition.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 3. Larsens Manufacturing Company. www.larsensmfg.com.
 - 4. Potter-Roemer: www.potterroemer.com/#sle.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com/#sle.
 - 2. Larsen's Manufacturing Co; _____: www.larsensmfg.com/#sle.
 - 3. Potter-Roemer: www.potterroemer.com/#sle.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: 4-A, 60-B, C type.
 - 2. Size: 10 pound.
 - 3. Temperature range: Minus 40 degrees F to 120 degrees F.

- C. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: [10-A, 120-B, C] type.Size:
 - 2. 20 pound.size
 - 3. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

- A. Cabinet Construction: Non-fire rated.
- B. Cabinet Configuration: Recessed and Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Trim: Flat square edge, with 1-1/4 inch wide face.
- C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.
- D. Door Glazing: Acrylic plastic, opaque 1/8 inch thick, flat shape and set in resilient channel glazing gasket.
- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Fabrication: Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.
- H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.
- B. Lettering: "FIRE EXTINGUISHER" decal, or vinyl self-adhering, prespaced black lettering in accordance with authorities having jurisdiction (AHJ).
 - 1. Location: Applied to cabinet door.
 - 2. Color: Black.
 - 3. Orientation: Vertical.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.
- C. Place extinguishers in cabinets.

END OF SECTION

SECTION 107316.13 METAL CANOPIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Attached metal canopies.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete footings.
- B. Section 076100 - Sheet Metal Roofing: Canopy roof.
- C. Section 077123 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- I. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.
- J. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.
- K. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- L. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- M. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- N. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.
- O. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2020.
- P. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.
- Q. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi

Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

- R. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- S. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- T. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- U. ITS (DIR) - Directory of Listed Products; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.
- C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.
- D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.
- E. Designer's Qualification Statement.
- F. Manufacturer's Qualification Statement.
- G. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.05 QUALITY ASSURANCE

- A. Erector Qualifications: Company specializing in performing the work of this section.
- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site ready for erection.
- B. Package using methods that prevent damage during shipping and storage on site.
- C. Store materials under cover and elevated above grade.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Canopies:
 - 1. Mapes Industries; Super Lumideck: <https://mapes.com/#sle>. Design Basis.
 - 2. AVAdek, Inc. 12130 Galveston Road, Webster, TX 77598; Phone: 713-944-0988.
 - 3. Architectural Fabrication, Inc. 2100 E. Richmond Av., Fort Worth, TX; Phone: 817-926-7270.
 - 4. Prospiant, Inc. 5513 Vine St., Cincinnati, OH 45217. Phone: 513-242-0310.

2.02 METAL CANOPIES

- A. Shop Fabricated Aluminum Canopy
- B. Configuration: Layout and dimensions, column layout, canopy clearance, fascia profile, and roof covering design as indicated on drawings.
 - 1. Installation: Face-mounted to building structure.
- C. Performance Requirements:

1. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
 - a. Loads: In compliance with local building codes.
2. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F and surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

2.03 COMPONENTS

- A. Structural Steel Framing:
 1. Columns: ASTM A500/A500M, Grade B, round or rectangular tubing, sized to suit project design load requirements.
 2. Base and Top Plates: ASTM A36/A36M, with pre-drilled bolt holes.
 3. Beams: Wide flange, ASTM A572/A572M Grade 50.
 4. Other Structural Steel Members: ASTM A36/A36M.
- B. Structural Aluminum Framing: Alloy and temper 6063-T5, 6063-T6, or 6061-T6.
 1. Extruded Shapes and Tubes: ASTM B221 (ASTM B221M).
- C. Covering:
 1. Aluminum Standing Seam Panels: See Section 076100.
 2. Overhang: As indicated on drawings.
- D. Fascia: Same material as structural framework, 3 inches high.
- E. Anchor Bolts: ASTM A307 or ASTM A572/A572M, formed with bent shank, assembled with template for casting into concrete.
 1. Minimum exposed thread of 7 inches above footing and 23 inch minimum embedment.
 2. Provide nuts and washers as required for column leveling and plumbing.
- F. Concrete Footings: Refer to Section 033000 for additional requirements.

2.04 SHOP FABRICATION

- A. Provide a complete system ready for erection at project site.
- B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.
- C. Weld steel members in accordance with AWS D1.1/D1.1M.
- D. Weld aluminum members in accordance with AWS D1.2/D1.2M.
- E. Fabricate connections for bolt, nut, and washer connectors.

2.05 FINISHES

- A. Structural Steel Framing:
 1. Shop Primer: Rust-inhibitive red oxide.
- B. Aluminum Framing and Decking:
 1. High Performance Organic Coatings: AAMA 2604, multiple coats, thermally cured, fluoropolymer system.

2.06 ACCESSORIES

- A. Structural Bolts: ASTM F3125/F3125M, Grade A325, minimum 3/4 inch diameter.
- B. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.
- C. Fasteners, Non-Structural: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and site area for conditions that might prevent satisfactory installation.
- B. Verify that foundation, electrical utilities, and placed anchors are in correct position.

- C. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION - FRAMING

- A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.
- B. Set column base plates with non-shrink grout to achieve full plate bearing.
- C. Fasten columns to anchor bolts.
- D. Do not field cut or alter structural members without approval.
- E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 INSTALLATION - CANOPY COVERING

- A. Install in accordance with manufacturer's instructions.
- B. Fasten metal decking to metal support members, aligned level and plumb.
- C. Install fascia panels, trim, and flashing.
- D. Separate dissimilar metals using concealed bituminous paint.
- E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.04 TOLERANCES

- A. Maximum Variation from Level: Plus/Minus 1/8 inch.

3.05 CLEANING

- A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.06 PROTECTION

- A. Protect canopy after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION

**SECTION 107316.13
METAL CANOPIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Attached metal canopies.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete footings.
- B. Section 076100 - Sheet Metal Roofing: Canopy roof.
- C. Section 077123 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
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- D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- I. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.
- J. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.
- K. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- L. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- M. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- N. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.
- O. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2020.
- P. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.
- Q. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi

Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

- R. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- S. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- T. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- U. ITS (DIR) - Directory of Listed Products; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.
- C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.
- D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.
- E. Designer's Qualification Statement.
- F. Manufacturer's Qualification Statement.
- G. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.05 QUALITY ASSURANCE

- A. Erector Qualifications: Company specializing in performing the work of this section.
- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site ready for erection.
- B. Package using methods that prevent damage during shipping and storage on site.
- C. Store materials under cover and elevated above grade.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Canopies:
 - 1. Mapes Industries; "cantilever": <https://mapes.com/#sle>. Design Basis.
 - 2. AVAdek, Inc. 12130 Galveston Road, Webster, TX 77598; Phone: 713-944-0988.
 - 3. Architectural Fabrication, Inc. 2100 E. Richmond Av., Fort Worth, TX; Phone: 817-926-7270.
 - 4. Prospiant, Inc. 5513 Vine St., Cincinnati, OH 45217. Phone: 513-242-0310.

2.02 METAL CANOPIES

- A. Shop Fabricated Aluminum Canopy
- B. Configuration: Layout and dimensions, column layout, canopy clearance, fascia profile, and roof covering design as indicated on drawings.
 - 1. Installation: Face-mounted to building structure.
- C. Performance Requirements:

1. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
 - a. Loads: In compliance with local building codes.
2. Thermal Movement: Design canopy system to accommodate thermal movement caused by ambient temperature range of 120 degrees F and surface temperature range of 180 degrees F without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects on assembly components.

2.03 COMPONENTS

- A. Structural Steel Framing:
 1. Columns: ASTM A500/A500M, Grade B, round or rectangular tubing, sized to suit project design load requirements.
 2. Base and Top Plates: ASTM A36/A36M, with pre-drilled bolt holes.
 3. Beams: Wide flange, ASTM A572/A572M Grade 50.
 4. Other Structural Steel Members: ASTM A36/A36M.
- B. Structural Aluminum Framing: Alloy and temper 6063-T5, 6063-T6, or 6061-T6.
 1. Extruded Shapes and Tubes: ASTM B221 (ASTM B221M).
 - a. 3x3 Extruded Supershade Blades.
 - b. 8" J Extruded fascia w/drain and weep holes.
 - c. Hanger pipe system w/welded eye bolt & cover plate.
 - d. 2 coat Kynar black factory finish.
- C. Covering:
 1. Aluminum Standing Seam Panels: See Section 076100.
 2. Overhang: As indicated on drawings.
- D. Fascia: Same material as structural framework, 3 inches high.
- E. Anchor Bolts: ASTM A307 or ASTM A572/A572M, formed with bent shank, assembled with template for casting into concrete.
 1. Minimum exposed thread of 7 inches above footing and 23 inch minimum embedment.
 2. Provide nuts and washers as required for column leveling and plumbing.
- F. Concrete Footings: Refer to Section 033000 for additional requirements.

2.04 SHOP FABRICATION

- A. Provide a complete system ready for erection at project site.
- B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.
- C. Weld steel members in accordance with AWS D1.1/D1.1M.
- D. Weld aluminum members in accordance with AWS D1.2/D1.2M.
- E. Fabricate connections for bolt, nut, and washer connectors.

2.05 FINISHES

- A. Structural Steel Framing:
 1. Shop Primer: Rust-inhibitive red oxide.
- B. Aluminum Framing and Decking:
 1. High Performance Organic Coatings: AAMA 2604, multiple coats, thermally cured, fluoropolymer system.

2.06 ACCESSORIES

- A. Structural Bolts: ASTM F3125/F3125M, Grade A325, minimum 3/4 inch diameter.
- B. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.
- C. Fasteners, Non-Structural: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and site area for conditions that might prevent satisfactory installation.
- B. Verify that foundation, electrical utilities, and placed anchors are in correct position.
- C. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION - FRAMING

- A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.
- B. Set column base plates with non-shrink grout to achieve full plate bearing.
- C. Fasten columns to anchor bolts.
- D. Do not field cut or alter structural members without approval.
- E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 INSTALLATION - CANOPY COVERING

- A. Install in accordance with manufacturer's instructions.
- B. Fasten metal decking to metal support members, aligned level and plumb.
- C. Install fascia panels, trim, and flashing.
- D. Separate dissimilar metals using concealed bituminous paint.
- E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.04 TOLERANCES

- A. Maximum Variation from Level: Plus/Minus 1/8 inch.

3.05 CLEANING

- A. Clean surfaces of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.06 PROTECTION

- A. Protect canopy after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION

SECTION 111316 - LOADING DOCK SEALS AND HOODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Foam-pad dock seals.
2. Steel dock hood.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include checklist of required site-specific dimension and loading dock information.

C. Samples: Submit two (2) cuts of seal covering, 12-inch x 12-inch, for each exposed product and for each color and texture specified.

D. Operation Data: Provide operating instructions, identify unit limitations.

E. Maintenance Data: Provide unit maintenance information, lubrication cycles, spare parts manual.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Subject to compliance with requirements, provide products by the following:

1. Pioneer Dock Equipment.
2. No Substitutions.

2.2 FOAM-PAD DOCK SEALS

A. Product: Pioneer 'PF Series Headcap Type Dock-seal' – exact model and dimension information is specific to project loading dock requirements. General Contractor to coordinate with product vendor.

B. General: Dock seals consisting of fabric-covered foam pads designed to compress 4- to 5-inches (102 to 127 mm) under pressure of truck body.

C. Stationary Head Pad: 12-inches (305 mm) high and same depth as jamb pads; sized for opening width.

- D. Jamb Pads: Beveled; tapered to reduce opening width.
 - 1. Nominal Size: 10-inches (254 mm) wide or as indicated on Drawings and sized for opening height.
- E. Construction: Consisting of single- or double-ply, coated, fabric-covered, urethane-foam core with supporting frame.
 - 1. Wood Support Frame: Factory-painted wood; with steel mounting hardware.
 - 2. Tapered Side Panels: Taper side panels to angle required to accommodate sloped loading dock approach grades and make sealing edge of dock shelter parallel to back edge of truck. Taper for declined or inclined approach as indicated.
- F. Materials:
 - 1. Cover Fabric: Hypalon-coated nylon with minimum total weight of 16 oz./sq. yd. (543 g/sq. m).
 - 2. Fabric Color: As selected by Architect from manufacturer's full range.
 - 3. Guide Strips: 4-inch- (102-mm-) wide, coated, nylon guide strips on jamb pads.
 - 4. Wood: DOC PS 20-dimension lumber, select structural grade, kiln dried.
- G. Steel Finish: Hot-dip galvanize components to comply with the following:
 - 1. ASTM A 153/A 153M or ASTM F 2329 for iron and steel hardware and anchors.

2.3 STEEL DOCK HOOD

- A. Materials:
 - 1. Product: Pioneer Model number H1024, based on an 8 ft door width for the project, and pre-assembled at factory.
 - 2. Material: 16-gauge galvanized steel unless shown otherwise on Drawings.
 - 3. Mounting Height: Reference Drawings.
 - 4. Size: Provide hood that projects 24 inches from face of wall, is 9" high, and which extends 12-inches minimum beyond edge opening of each jamb with integral 2" x 2" gutter.
 - 5. Final Finish: Reference Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Dock Seals: Attach dock-seal support frames securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure compression of dock seals when trucks are positioned against dock bumpers.
- B. Dock Hood: Erect hood components in accordance with manufacturer's instructions. Set plumb and level. Attach with manufacturer's suggested anchors and fittings.
- C. After completing installation, inspect exposed factory finishes and repair damaged finishes.

END OF SECTION 111316

SECTION 111319 - STATIONARY LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Edge-of-dock levelers with dock bumpers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For stationary loading dock equipment.
 - 1. Include plans, elevations, sections, details, and attachments to other work.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace dock levelers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

PART 2 - PRODUCTS

2.1 EDGE-OF-DOCK LEVELERS

- A. General: Surface-mounted, hinged-lip-type, edge-of-dock levelers designed for permanent installation on face of loading dock platform.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Pioneer, Model BL66-17.
 - 2. No Substitutions.

- B. Standard: Comply with MH 30.1, except for structural testing to establish rated capacity.
- C. Rated Capacity: Capable of supporting total gross load of 20,000 lb., without permanent deflection or distortion.
- D. Platform Ramp Width: 66-inches (1676 mm).
- E. Hinged Lip: Not less than 3/8-inch- (9.5-mm-) thick, nonskid steel tread plate.
 - 1. Hinge: Full-width, piano-type hinge with heavy-wall hinge tube and grease fittings, with gussets on lip and ramp for support.
- F. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.
 - 1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:
 - a. Above Adjoining Platform: 5-inches (127 mm).
 - b. Below Adjoining Platform: 5-inches (127 mm).
 - 2. Lip Operation: Manufacturer's standard mechanism, which automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck and automatically retracts lip when truck departs.
 - a. Length of Lip Extension: 17-inches (432 mm).
 - 3. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs. Leveler shall be capable of retracting to stored position while truck is at loading dock.
- G. Mechanical Operating System: Manual control; counterbalance and spring operation. Spring-operated raising and walk-down lowering of unloaded ramp. Equip leveler with a torsion-spring counterbalancing mechanism controlled by a hold-down device.
 - 1. Lever Handle: Self-storing lever handle for raising unloaded ramp with minimal lifting force by pulling lever back to extend lip and pushing lever forward to lower ramp and lip.
- H. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- and formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.
 - 1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.
 - 2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.

- I. Integral Molded-Rubber Dock Bumpers: Fabricated from 6-inch- (152-mm-) thick as standard with manufacturer, heavy molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Type A Shore durometer hardness of 80, plus or minus 5, when tested according to ASTM D 2240. Provide (2) two dock bumpers for each dock leveler, attached to face of loading dock with expansion bolts.
- J. Materials:
 - 1. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.
 - 2. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55 (380).
 - 3. Steel Tubing: ASTM A 500/A 500M, cold formed.
 - 4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- K. Dock-Leveler Finish: Manufacturer's standard finish.

2.2 FINISH REQUIREMENTS

- A. Galvanizing: Hot-dip galvanize components to comply with the following:
 - 1. ASTM A 123/A 123M for iron and steel loading dock equipment.
 - 2. ASTM A 153/A 153M or ASTM F 2329 for iron and steel hardware for loading dock equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Edge-of-Dock Levelers: Attach dock levelers to loading dock platform in a manner that complies with requirements indicated for arrangement and position relative to top of platform.
 - 1. Weld anchor holes in contact with continuous embedded loading dock edge channel. Weld or bolt bumper blocks to face of loading dock.
- B. Adjust loading dock equipment to function smoothly and safely and lubricate as recommended by manufacturer.
- C. Test dock levelers for vertical travel within operating range indicated.
- D. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

3.2 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment.

END OF SECTION 111319

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SECTION 124814 – ENTRANCE FLOOR MATS AND FRAMES (REQUIRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Entry floor mat systems, including metal and vinyl foot grids.

B. Related Requirements:

1. Section 033000 "Cast-In-Place Concrete"

1.2 REFERENCES

A. ASTM – American Society for Testing and Materials

1. ASTM C1028 – Standard Test Method for Determining the Static Coefficient of friction of Ceramic Tile and other like-surfaces by the Horizontal Dynamometer Pull-Meter Method
2. ASTM E648 – Standard Test Method for Critical radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source

B. National Fire Protection Association

1. NFPA 253 – Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source

1.3 ACTION SUBMITTALS

A. General: Submit the following in accordance with specification section 013300.

B. Product Data: For each type of floor mat and frame specified including manufacturer's specifications and installation instructions.

C. Shop drawings in sufficient detail showing layout of different mat types and frame specified including details indicating construction relative to materials, direction of traffic, spline locations, profiles, anchors (clips) and accessories.

1. Shop drawings to include plans showing locations for each type of floor mat, location of clips, U-channels, angles, and cuts in layout for cleaning removal as indicated on drawings.

D. Samples for verification purposes: Submit a sample of floor mat and frame members with selected tread insert showing each type and color for exposed floor mats, frames and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Provide sample of manufacturer's standard limited warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data in the form of manufacturer's printed instructions for cleaning and maintaining floor mats.

1.6 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish extra matching materials that are from the same production run as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish 5-percent of amount installed for each type, color, pattern, and size specified.

1.7 QUALITY ASSURANCE

- A. Flammability in accordance with ASTM E648, Class I, Critical Radiant Flux, minimum 0.45 watts/m².
- B. Slip resistance in accordance with ASTM D2047 96, Coefficient of Friction, Minimum 0.60 for accessible routes.
- C. Standard rolling load performance is 1000 lb./wheel for modular tiles and 600 lb./wheel for carpeted modular tiles with larger loading requirements as specified (load applied to a solid 5-inch by 2-inch-wide polyurethane wheel, 1,000 passes without damage).
- D. Single source responsibility: Obtain all floor mats and frames from one source of a single manufacturer.
- E. Utilize recyclable, UV resistant PVC/NBR.
- F. Utilize a manufacturer that is ISO 9001 and 14001 certified.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project site ready for use in unopened original factory packaging clearly labeled to identify manufacturer; protect product from damage due to weather, high temperatures and construction operations. Materials must be delivered sufficiently in advance of installation to condition materials to the required temperature for 48-hours prior to installation.

1.9 PROJECT CONDITIONS

- A. Field measurements: Check actual openings for mats by accurate field measurements before fabrication. Record actual measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

- B. Coordinate frame installation with concrete construction to ensure slab and frame anchorage are accurate and that the base is level and flat. Notify Architect if slab is not level and flat. Defer frame installation until building enclosure is complete and related interior finish work is in progress. (Note: for locations with recessed slabs verify recessed area and edges are also level and flat.)
- C. Maintain temperature where products will be installed before, during and after installation as recommended by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Portico Systems. 102 Trade Street, Greer, South Carolina 29651; Website: www.porticosystems.com Reference Sheet VC1 for vendor contact information.
- B. No substitutions permitted.

2.2 FLOOR MATS AND FRAMES

- A. Foot Grid: Constructed from 30% post-industrial recycled polyvinyl chloride (PVC) if gray or other colors, and up to 100% post-industrial recycled TPE if black. Welded in a non-hinged, grille design with an embossed non-skid surface, (non-embossed surfaces not acceptable) to sizes indicated with the following characteristics:
 - 1. Snap Trax Tile: Extruded TPE Grid, black color.
 - 2. Snap Trax Plus Tile: Extruded TPE/PVC Grid, black grid, grey carpet color.
- B. Framing and Nosing Accessories for Vinyl Foot Grille:
 - 1. Recessed Application: Snap Trax or Snap Trax Plus Tile: 0.47-inch: use "J" frame, mill finish aluminum, or "R" frame. Optional: 3/8-inch, "T" Section Divider.
 - 2. Surface Mounted Application: .47-inch grid and beveled, heavy-duty attached nosing. Provide manufacturer's standard edge trims as required.
 - 3. Total thickness including the inserts is 0.47-inch.
 - 4. Manufacturer's standard aluminum tapered ADA accessible ramp trim as required at exposed edges, and as indicated on the drawings.
- C. Product Testing for Vinyl Foot Grid:
 - 1. Product Name: Snap Trax Tile by Portico Systems.
 - 2. Limited Wear Warranty: (3) three years.
 - 3. Material: 100% TPE.
 - 4. Color: Black only.
 - 5. Material Size: 19.69-inches x 19.69-inches.
 - 6. Flammability (E648/NFPA 253): ≥ 0.45 watts/sq. cm for Class 1 is required.
 - 7. Smoke Density (ASTM E662/NFPA 258): < 450 is required.
 - 8. Friction (ASTM D-2047-96): Wet 0.60.
 - 9. Substrate Preparation: Per ASTM F710 and the manufacturer's installation instructions.
 - 10. Rolling Load: 1,000 lbs. per wheel.

D. Product Testing for Vinyl Foot Grid with Carpet:

1. Product Name: Snap Trax Tile by Portico Systems.
2. Limited Wear Warranty: (3) three years.
3. Material: Utilizes recyclable, UV resistant TPE/PVC.
4. Color: Black Grid, Grey Carpet.
5. Material Size: 19.69-inches x 19.69-inches.
6. Flammability (E648/NFPA 253): ≥ 0.45 watts/sq. cm for Class 1 is required.
7. Smoke Density (ASTM E662/NFPA 258): < 450 is required.
8. Friction (ASTM D-2047-96): Wet 0.60.
9. Substrate Preparation: Per ASTM F710 and the manufacturer's installation instructions.
10. Rolling Load: 1,000 lbs. per wheel.

E. No substitutions permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Examine area and conditions under which Work is performed and identify conditions detrimental to proper or timely completion. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Manufacturer shall offer assistance and guidance to provide a template of irregularly shaped mat assemblies to ensure proper installation.

3.3 INSTALLATION

- A. Install the Work of this section in strict accordance with the manufacturer's recommendations.
- B. Set mat at height recommended by manufacturer for most effective cleaning action.
- C. Coordinate top of mat surfaces with bottom of doors that swing across to provide ample clearance between door and mat.

3.4 CLEANING

- A. It is important to maintain the life cycle of the entrance mat that a maintenance schedule be developed which includes regular vacuuming and extraction that correctly matches the amount of traffic the mat incurs.

3.5 PROTECTION

- A. For locations with recessed floor entry mats: After completing required frame installation and concrete work, provide temporary filler of plywood or fiberboard in recessed area to fill entire recessed area, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.

- B. Defer installation of floor mats, and edge trim, until time of substantial completion of project.
- C. GC to replace any damaged mat tiles, framing components and/or accessories due to construction traffic at no cost to Owner.
- D. GC to protect slab from potential construction damage during construction phase. Damaged areas of slab to be repaired/re-poured at Owners direction to nearest control joint in slab, finish to match adjacent sales floor slab finishes. (Note: For recessed slabs provide edge protection as required and repair edges damaged during construction.)
- E. After mat installation is completed, protect from damage until time of store opening.

END OF SECTION 124814

SECTION 211000 – WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. The extent of this fire sprinkler system shall be as specified herein. Contractor shall be responsible for preparation of design drawings, hydraulic calculations, fabrication and installation for complete fire sprinkler protection for the building.
- B. This Section specifies:
 - 1. Automatic sprinkler systems
 - 2. Materials and equipment specified in this Section include:
 - a. Pipe, fittings, valves, and specialties.
 - b. Skid Mounted Fire Pump
 - c. Sprinklers
 - d. Accessories
- C. Contractor shall be responsible for all permits and fees associated with preparation and approval of Drawings and the installation and approval of fire sprinkler system.
- D. Products furnished include sprinkler cabinet with spare sprinklers.
- E. Tests and Inspections: Arrange, test, and pay for all tests required by code and Authorities Having Jurisdiction.
- F. Water supply information is indicated on drawings.
- G. The hydraulic area of operation may not be reduced as allowed by NFPA 13 for areas utilizing quick response sprinklers.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.
- B. ASTM International (ASTM):
 - 1. ASTM A 47 – Ferritic Malleable Iron Castings.
 - 2. ASTM A 53 – Pipe, Steel, Black And Hot-Dipped, Zinc-Coated, Welded And Seamless.
 - 3. ASTM A 135 – Electric-Resistance-Welded Steel Pipe.
 - 4. ASTM A 234 – Piping Fittings Of Wrought Carbon Steel and Alloy Steel For Moderate And High Temperature Service.
 - 5. ASTM A 536 – Ductile Iron Castings.
 - 6. ASTM A 795 – Black and Hot-Dipped Zinc-Coated (Galvanized) Welded Or Seamless, For Fire Protection Use.
 - 7. ASTM A 865 – Threaded Couplings, Steel, Black or Zin-Coated (Galvanized) Welded Or Seamless, For Use In Steel Pipe joints.

C. American Society of Mechanical Engineers (ASME):

1. ASME B 16.1 - Cast Iron Pipe Flanges And Flanged Fittings.
2. ASME B 16.3 - Malleable Iron Threaded Fittings.
3. ASME B 16.4 - Gray Iron Threaded Fittings.
4. ASME B 16.5 - Pipe Flanges And Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard.
5. ASME B 16.9 - Factory-Made Wrought Buttwelding Fittings.
6. ASME B 16.11 - Forged Fittings, Socket-Welding And Threaded.

D. Building Code:

1. As shown on the Drawings.

E. NFPA (National Fire Protection Association) 13, "Installation of Sprinkler Systems", 2013 Edition.

F. NFPA 20, " Installation of Stationary Pumps for Fire Protection", Latest Edition.

G. NFPA 24, "Private Fire Service Mains and their Appurtenances", [2003][2007][2010][2013]

H. NFPA 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection Systems", Latest Edition.

I. NFPA 70, "National Electrical Code", Latest Edition

J. Underwriters Laboratories, "Fire Protection Equipment Directory", Latest Edition.

K. Factory Mutual System (FM): Approval Guide, Latest Edition,

L. Applicable local building and fire prevention codes and ordinances.

1.3 DEFINITIONS

- A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).
- B. Other definitions for fire protection systems are listed in NFPA Standards 13 and 24.
- C. Working Plans, also referred to as Fire Protection Drawings as used in this Section means those documents (including drawings and calculations) prepared pursuant to the requirements contained in NFPA 13 for obtaining approval of the Authority Having Jurisdiction.

1.4 SYSTEM DESIGN REQUIREMENTS

- A. Fire protection system in the building is a Wet Pipe System.
- B. Provide dry-pipe fire protection system for non-heated spaces and other areas of building subject to freezing including canopies and mansards. Portions of systems subject to freezing or temperatures below 40° F shall be protected against freezing as required by NFPA 13. The Contractor shall be responsible for repairs and for all costs incurred from damage caused by freezing of the fire protection system.

1.5 SUBMITTALS

- A. Product Data for each type sprinkler, piping, valve, piping specialty, and fire protection specialty specified. Highlight, mark, list or indicate the materials, performance criteria and accessories that are being proposed.
- B. Shop drawings prepared in accordance with NFPA 13 identified as "Working Plans," including hydraulic calculations where applicable, and which have been approved by the Authority Having Jurisdiction. Shop drawings shall be signed and sealed by a Professional Engineer, registered in the state in which the project is located. Shop drawings consisting of the following shall be furnished. Refer to NFPA 13 for additional requirements.
 - 1. Layout drawings of complete overhead sprinkler system indicating relationship of all other trades. Shall include a reflected ceiling plan indicating sprinkler locations.
 - 2. Complete details and sections as required to clearly define and clarify the design indicated.
 - 3. Hydraulic calculations shall be based on a water flow test conducted at the site within twelve (12) months of the submittal of plans for approval. Flow test information shall be documented on shop drawings with an accompanying site plan. A minimum 5 psi safety factor shall be included in all calculations.
 - 4. Contractor to send (1) set of fire sprinkler submittals (drawings, calculations, equipment, etc.) to Architect and to [FM Global at ENGDallasPlanReview@fmglobal.com](mailto:FM_Global_at_ENGDallasPlanReview@fmglobal.com) Copy the Academy on the transmittal.
- C. Within 14 days afterward of prime contract, send submittals to Owner's Fire Protections Consultant as specified in Section 01330. Allow 10-day turn-around on submittals sent to Owner's Fire Protection Consultant.
- D. Fire Protection Consultant's electronic drawings files (i.e., DWG, DWF, PDF, etc.) will be provided to the Contractor for the purpose of submittals upon request in accordance with Division 22 Section, "General Plumbing Requirements."
 - 1. Send a copy of the Letter of Transmittal sent with the submittals to the Architect indicating date of and content of transmittal.
 - 2. Submittals shall be complete, accurate, and in full compliance with contract requirements for proper and timely approval.
 - 3. Contractor shall respond to shop drawing review comments within 15 days of receipt.
 - 4. Maintain two (2) copies of approved documents on site.
- E. Upon completion of the work, provide Record Drawings as required by other sections of these specifications showing location of all fire sprinkler system piping, valves, etc., as finally installed.
- F. Maintenance Data for each type sprinkler, valve, piping specialty, fire protection specialty, and fire department connection, for inclusion in operating and maintenance manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."
- G. Welders' qualification certificates.

- H. Test Reports and Certificates include "Contractor's Material & Test Certificate for Aboveground Piping" and "Contractor's Material & Test Certificate for Underground Piping" as described in NFPA 13.

1.6 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish spare parts described below matching products installed and identified with labels clearly describing contents.
 - 1. Sprinkler Wrenches: Furnish 2 sprinkler wrenches for each type of sprinkler installed.
 - 2. Sprinklers: Furnish extra sprinkler of each style included in the project as required by NFPA 13.
 - 3. Sprinkler Cabinet: Furnish steel cabinet, suitable for wall mounting, with hinged cover and space for appropriate quantity of spare sprinklers plus sprinkler wrench. Provide a separate cabinet for each style sprinkler on the project.

1.7 QUALITY ASSURANCE

- A. Qualifications for Welding Processes and Operators: Comply with the requirements of AWS D10.9, Specifications for Qualifications of Welding Procedures and Welders for Piping and Tubing, Level AR- 3."
- B. Threaded joints shall conform to ASME B1.20.1, Pipe Threads, General Purpose and the Pipe Fitters Handbook.
- C. Regulatory Requirements: Comply with all standards listed in Section 1.2 and all applicable local requirements.
- D. UL Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved (FM Insureds only) for fire service.
- E. Installer shall have a sprinkler contractor license issued by the Authorities Having Jurisdiction.

1.8 SYSTEM DESCRIPTION

- A. Wet Pipe Fire Sprinkler System (where pressures do not exceed 175 psi)
 - 1. General: Provide a complete sprinkler system in the areas previously described in this Section. The sprinkler system riser and accessories shall be installed where indicated on the Drawings Provide in accordance with the latest issue of NFPA 13. Coordinate locations of sprinklers with Architectural, Mechanical, and Electrical features of the building. All sprinklers in general shall be in a straight line parallel to the lines of the building, and in a symmetrical pattern with lights and air outlets.
 - 2. Operation:
 - a. The sprinkler system shall be supplied from the underground system as shown on the Drawings.

- b. A UL listed indicating monitoring valve, UL listed flow switch and inspectors test station shall be provided at each sprinkler system connection.
 - c. Each flow switch and monitoring valve shall be connected into the building fire alarm system. Any flow through the sprinkler system shall activate an alarm signal at the building fire alarm panel. Reference: Division 26 for WIRING.
 - d. Any flow through the system shall activate the exterior horn/strobe or bell as shown.
 - e. Each inspector's test station shall include a test valve, sight glass, orifice disk, and auxiliary drain valve. Provide drain valves in all low points of the system. Inspector's test(s) and main drain valve(s) shall be piped to the exterior of the building. Reference: Division 26 for WIRING.
- B. Base system design on water flow data shown on the Drawings. Verify actual backflow preventer to ensure correct friction loss is calculated.
- C. Authorities Having Jurisdiction may require hydraulically calculated densities, area of application, and hose allowance differing from those shown or specified. Verify and provide hydraulic calculations per Authorities Having Jurisdiction and these Contract Documents.
- D. Provide hydraulic calculation placard attached to each riser.
- E. Provide fire department connections where required.
- F. Provide hangers, supports and earthquake bracing per applicable building codes, Contract Documents, Authority Having Jurisdiction, NFPA 13, and Factory Mutual Global Property Loss Prevention Data Sheet 2-8, Earthquake Protection for Water-Based Fire Protection Systems.
- G. Interface sprinkler system with fire protection supervisory system.

1.9 ELECTRONIC DRAWING FILES

- A. In preparation of shop drawings or record drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DXF format from the Engineer Contact the Architect for Architect's written authorization. Contractor shall complete and send the form attached at the end of this section. Contractor shall indicate the desired shipping method and drawing format on the attached form. In addition to payment, Architect's written authorization and Engineer's release agreement form must be received before electronic drawing files will be sent.

PART 2 - PRODUCTS AND MATERIALS

2.1 EQUIPMENT

- A. All fire protection equipment shall be UL listed and FM approved for its intended use and in conformance with the applicable NFPA documents.

2.2 CONTRACTOR FURNISHED PRODUCTS

- A. Contractor will furnish and install skid mounted fire pump.

1. Manufacturer: Peerless Pump.
 - a. Primary Contact: William Diaz, Manufacturing Coordinator, (713) 457-5611; Cell (832) 795-9588. wdiaz@grundfos.com
 - b. Alternate Contact: Steve Gordon, Sales Manager of PES, (281) 705-9333; sgordon@grundfos.com
2. Contractor's responsibility of work under this Section includes, but is not limited to, the following:
 - a. Contact skid mounted fire pump vendor to coordinate and schedule delivery to site.
 - b. Coordinate and install underground fire sprinkler service entry prior to completion of skid mounted fire pump pad.
 - c. Coordinate and install underground electrical service prior to completion of skid mounted fire pump pad.
 - d. Coordinate and install concrete pad for skid mounted fire pump.
 - e. Receipt and placement of skid mounted fire pump within the building structure.
3. Place skid mounted fire pump in full operation.

2.3 PIPE AND TUBING MATERIALS

- A. General: Refer to Part 3 Article "PIPE APPLICATIONS" for identification of systems where the below-specified pipe and fitting materials are used.
- B. Steel Pipe:
 1. All threaded piping 2-inch and smaller: ASTM A135 or 795, Grade A, Schedule 40, ERW, black steel pipe, threaded or roll grooved ends. All 1-inch piping shall have threaded ends.
 2. All grooved piping 2" and larger: ASTM A135 or 795, Grade A, Schedule 10, ERW, black steel pipe, roll grooved ends.
 3. All piping used in dry pipe sprinkler systems shall be ASTM A135 or 795, Grade A, Schedule 40, ERW, black steel pipe, threaded or roll grooved ends.
 4. All piping on the exterior of the building shall be externally galvanized.
 5. Acceptable alternatives to Schedule 40 and Schedule 10 pipe shall be manufactured to standards recognized by NFPA 13. Threaded pipe shall have a corrosion resistance rating (CRR) of 1.0 or greater. Crimp type couplings shall not be used. Threadable thinwall pipe with CRR less than 1.0 not permitted.
- C. Flexible Piping Systems:
 1. In lieu of rigid pipe offsets or return bends for sprinkler drops, Multiple-Use Flexible Stainless Steel Sprinkler Drop System may be used to locate sprinkler as required by final finished ceiling tiles, drywall ceilings and walls. The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel Male treaded nipple for connection to branch-line piping, and a zinc plated steel reducer with a female tread for connection to the sprinkler head.
 2. The drop shall include a FM approved Heli-Coil design similar to the AH2 braided hose. The hose shall be listed for FM design [(2) bends at 31" length] [(2) bends at 36" length] [(4) bends at 60" length] [(4) bends at 72" length].

3. The flexible drop shall attach to the ceiling grid using a one-piece open gate style bracket. The bracket shall allow installation before the ceiling tile is in place. Braided drop system shall be UL listed and FM approved for sprinkler services to 175 psi. FM-1637 and UL 2443

2.4 FITTINGS AND COUPLINGS

- A. Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- B. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- C. Steel Fittings: ASTM A234, seamless or welded, for welded joints.
- D. Grooved Mechanical Fittings: ASTM A536, Grade 65-45-12 ductile iron; ASTM A47 Grade 32510 malleable iron; or ASTM A53, Type F or Types E or S, Grade B fabricated steel fittings with grooves or shoulders designed to accept grooved end couplings.
- E. Grooved Mechanical Couplings: consist of cast ductile iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure roll-grooved pipe and fittings. Grooved mechanical couplings including gaskets used on dry-pipe systems shall be listed for dry-pipe service.
- F. All Grooved components (couplings, ells, tee, and other devices) shall be by the same manufacture.
- G. Cast-Iron Flanges: ANSI B16.1, Class 125, raised ground face, bolt holes spot faced.
- H. Cast Bronze Flanges: ANSI B16.24, Class 150, raised ground face, bolt holes spot faced.
- I. Unions: ASME B16.39, malleable iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces, female threaded ends. Threads shall conform to ASME B1.20.1.
- J. Dielectric Unions: Threaded, solder, or grooved-end connections as required to suit application; constructed to isolate dissimilar metals, prevent galvanic action, and prevent corrosion.

2.5 JOINING MATERIALS

- A. Welding Materials: Comply, with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.
 1. Brazing Filler Metals: AWS A5.8, Classification BAg1 (Silver).
 2. Solder Filler Metals: ASTM B 32, 95-5 Tin-Antimony.
- B. Gasket Materials: thickness, material, and type suitable for fluid or gas to be handled, and design temperatures and pressures.

2.6 HANGERS

- A. Shall be UL and FM listed and shall meet requirements of NFPA 13 for type, dimension and location.

2.7 GENERAL DUTY VALVES

- A. General: Install fire protection specialty valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 13, and the Authority Having Jurisdiction.
- B. Gate Valves - 2 Inch and Smaller: Body and bonnet of cast bronze, threaded ends, solid wedge, outside screw and yoke (OS&Y), rising stem, screw-in bonnet, and malleable iron handwheel. Valves shall be capable of being repacked under pressure, with valve wide open. 175 psi working pressure where system operating pressure is at or below 175 psi; minimum 250 psi working pressure where system operating pressure exceeds 175 psi.
- C. Gate Valves - 2-1/2 Inch and Larger: Iron body; bronze mounted. Valves shall have solid taper wedge; outside screw and yoke (OS&Y), rising stem; flanged bonnet, with body and bonnet conforming to ASTM A 126 Class B; replaceable bronze wedge facing rings; flanged ends; and a packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing. Valves shall be capable of being repacked under pressure, with valve wide open. 175 psi working pressure where system operating pressure is at or below 175 psi; minimum 250 psi working pressure where system operating pressure exceeds 175 psi.

2.8 BACKFLOW PREVENTERS

- A. Backflow Preventers: Complying with requirements of ASSE Standard 1015, AHJ, UL listed and FM approved.

1. 2-1/2" through 10" connections:

- a. Double check type, model 2000SS by Ames, or model 350A or 350OSY by Wilkins.
- b. Double detector check type, model 3000SS by Ames, or model 350ADA or 350DA by Wilkins.
- c. Reduced pressure type, model 4000SS by Ames, or model 375A or 375OSY by Wilkins.
 - 1) When utilizing a reduced pressure backflow preventer, equip backflow preventer with air gap drain piped to an approved outside location.
- d. Reduced pressure detector type, model 5000SS by Ames, or model 375ADA or 375DA by Wilkins.
 - 1) When utilizing a reduced pressure backflow preventer, equip backflow preventer with air gap drain piped to an approved outside location.
- e. Reduced pressure type (Vertical), model 475V by Wilkins.

- 1) When utilizing a reduced pressure backflow preventer, equip backflow preventer with air gap drain piped to an approved outside location.
- B. Provide backflow preventer assemblies in accordance with manufacturer's recommendations and requirements of Authorities Having Jurisdiction and Contract Documents.
- C. Backflows listed are not intended to prevent the use of current technology.

2.9 AUTOMATIC SPRINKLERS

- A. Sprinklers: type and style as indicated or required by application. Sprinkler operating temperatures to comply with NFPA 13. Sprinklers in light hazard areas shall be quick response type.
- B. Sprinkler Finishes: Provide sprinklers with the following finishes:
 1. Finished areas: Factory Painted to match Architectural color semi-recessed pendent type with matching escutcheons or white sidewall type with matching escutcheons.
 2. Unfinished areas and areas not exposed to view: Upright, pendent and sidewall type, rough bronze finish. Sprinklers shall be wax-coated where installed exposed to acids, chemicals, or other corrosive fumes.

2.10 ALARM DEVICES

- A. General: Types and sizes shall mate and match piping and equipment connections.
- B. Water Flow Indicators (Wet-pipe Systems): vane type waterflow detector, rated to 250 psig; designed for horizontal or vertical installation; have 2-SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere 125 volts AC and 0.25 ampere 24 Volts DC; complete with factory-set, field-adjustable retard element to prevent false signals, and tamperproof cover.
- C. Audible/Visual Alarm Notification Appliances (Horn/Strobe): NFPA 72, combination horn and strobe lamp. Strobes shall be xenon or equivalent, unfiltered or clear filtered white light, a minimum intensity of 15/75 candela and as indicated on Drawings, flash rate range from 1 to 3 Hz, a maximum pulse duration of 0.2 sec with a maximum duty cycle of 40%. Minimum audible level and strobe intensity shall meet all requirements of the Americans with Disabilities Act. Audible/visual notification appliance shall be exterior, weatherproof with weatherproof backbox and shall only activate on waterflow in the fire sprinkler system(s).
- D. Supervisory Switches: SPST, normally closed contacts, designed to signal valve in other than full open position and tamperproof cover.

2.11 FIRE DEPARTMENT CONNECTION

- A. Siamese Fire Department Connection: UL listed, rough brass "siamese" fire department connection with individual type drop clapper valves and drain, located where indicated on Drawings. Fire department connection shall be complete with pin lug type brass hose inlet caps with chains for spanner wrench operation. Hose threads shall be compatible with local fire department specifications. Provide check valve sized per NFPA 13 with

3/4" ball drip drain piped to the exterior of the building. Fire department connection shall be permanently labeled "AUTOMATIC SPRINKLER FIRE DEPARTMENT CONNECTION".

PART 3 - EXECUTION

3.1 PIPE APPLICATIONS

- A. Piping Below Grade: Refer to Exterior Domestic Water specification.
- B. Piping Above Grade: Black steel for all fire sprinkler system piping located inside the building, not exposed to the elements. Galvanized piping shall be used for all fire sprinkler system piping located on the exterior of the building, exposed to the elements.

3.2 PIPING INSTALLATIONS

- A. Locations and Arrangements: Coordinate installation of horizontal piping with other components. Allow sufficient space above removable ceiling panels to allow for panel removal.
- B. Install system such that all piping is rigidly secured and supported. All ductwork, lights, structural members and main runs of piping shall take precedence over sprinkler piping. Offset sprinkler piping as required to avoid all ductwork, lights, structural members and piping. Cutting of structural members for passage of sprinkler pipes or hangers will not be permitted. All horizontal piping in ceiling space shall be at an elevation above the top of light fixtures and air outlets to allow for access to light fixtures and air outlets without removing horizontal piping. Route all sprinkler piping and provide all offsets, bends, and elbows around all mechanical, electrical, and structural members as required. In areas with ceilings, piping shall be routed concealed, above ceiling. In areas without ceilings, piping shall extend as high as possible.
- C. Route piping and locate sprinklers as required to avoid building structure, equipment, plumbing piping, heating and air conditioning piping, ductwork, lighting fixtures, electrical conduits and bus ducts, and similar work. Locate center of sprinkler a minimum of 6 inches off ceiling grid.
 - 1. Final location of lighting and exposed ductwork shall have priority over pipe routing and final sprinkler locations.
 - 2. Sprinkler piping in sales area without a ceiling and stockroom shall be located above bottom of joists. Minimum height of sprinkler piping in areas with ceilings shall be 1'-0" above ceiling.
- D. Deviations from approved "Working Plans" for sprinkler piping require written approval of the Authority Having Jurisdiction. Written approval shall be on file with the Engineer prior to deviating from the approved "Working Plans."
- E. Install sprinkler piping to provide for system drainage in accordance with NFPA 13.
- F. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

- G. Install unions in pipes 2 inch and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.
- H. Install flanges or flange adapters on valves, apparatus, and equipment having 2-1/2 inch and larger connections.
- I. Hangers and Supports: Comply with the requirements of NFPA 13 and NFPA 14. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake if required by the applicable building code, designed in accordance with NFPA 13. Locate hangers at or directly adjacent to the joist panel points. Provide two nuts on threaded supports to securely fasten the support.
- J. Make connections between underground and aboveground piping using an approved transition piece strapped or fastened to prevent separation.
- K. Install mechanical sleeve seal at pipe penetrations in basement and foundation walls. Refer to Division 22 Section "Basic Piping Materials and Methods."
- L. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.
- M. Install pressure gauge on the riser or feed main at or near each test connection. Provide gauge with a connection not less than 1/4 inch and having a soft metal seated globe valve arranged for draining pipe between gauge and valve. Install gauges to permit removal, and where they will not be subject to freezing.

3.3 PIPE JOINT CONSTRUCTION

- A. Welded Joints: AWS D10.9, Level AR-3.
- B. Threaded Joints: conform to ANSI B1.20.1, tapered pipe threads for field cut threads and Pipe Fitter's Handbook. Join pipe, fittings, and valves as follows:
 - 1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - 2. Align threads at point of assembly.
 - 3. Apply appropriate tape or thread compound to the external pipe threads.
 - 4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
 - 5. Damaged Threads: Do not use pipe with threads that are corroded, or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.
- C. Flanged Joints: Align flanged surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.
- D. Mechanical Grooved Joints: roll grooves on pipe ends dimensionally compatible with the couplings.

- E. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
 - 1. WARNING: Some filler metals contain compounds that produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.
- F. End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

3.4 VALVE INSTALLATIONS

- A. General: Install fire protection specialty valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 13 and 14, and the Authority Having Jurisdiction.
- B. Gate Valves: Install supervised-open gate valves so located to control all sources of water supply except fire department connections. Where there is more than one control valve, provide permanently marked identification signs indicating the portion of the system controlled by each valve. Refer to Division 22 Section "Identification for Plumbing Piping & Equipment" for valve tags and signs.

3.5 BACKFLOW PREVENTER INSTALLATIONS

- A. Install backflow preventer at each fire protection entry in compliance with the plumbing code and Authority Having Jurisdiction. Locate in an accessible and testable location.

3.6 SPRINKLER INSTALLATIONS

- A. Use proper tools to prevent damage during installations.
- B. Areas with ceilings: Install sprinklers not less than 6-inches from the edge of a ceiling tile in areas with suspended ceilings, in a symmetrical pattern with lights and outlets. Install sprinklers in a symmetrical pattern with lights and outlets in all other areas with ceilings.
- C. Areas without ceilings: Install pendent or upright sprinklers in accordance with NFPA 13.

3.7 FIRE DEPARTMENT CONNECTION INSTALLATIONS

- A. Install automatic drip valves at the check valve on the fire department connection.
- B. Install connections between 18- and 36-inches above finished grade and as indicated on the Drawings.
- C. Install mechanical sleeve seal at pipe penetration.
- D. Provide minimum 36-inch working clearance around connection for fire department access.

3.8 SKID MOUNTED FIRE PUMP

- A. Examine surfaces and adjacent areas in which Work under this Section is to be performed. Report in writing to Owner's Construction Manager prevailing conditions that may adversely affect satisfactory execution of Work. Do not proceed with Work until unsatisfactory conditions have been corrected.

- B. Construction of skid mounted fire pump pad shall be completed before completion of foundation stem wall and delivery of structural steel. Coordinate installation of skid mounted fire pump.
- C. Set, level, square, grout, and fill skid mounted fire pump on prepared base in accordance with manufacturer's instructions at location indicated on Drawings. Align skid mounted fire pump with fire service stub-up to inlet pipe of skid mounted fire pump. Pump package must be installed level and piping must mate with pump flanges without strain. Anchor skid mounted fire pump to slab $\frac{3}{4}$ " diameter A307 threaded rod anchors set in epoxy adhesive with minimum 4 inch embedment in concrete slab. Install in each bolt hole provided through the skid beam per manufacture's specification.
- D. Provide piping and backflow preventer as required and connect fire service stub-up to skid mounted fire pump.
- E. Connect system piping to risers.
- F. Provide fire department connection and piping to skid mounted fire pump.
- G. Install fire pump test header furnished by Fire Pump Vendor and connect to fire pump manifold.
- H. Install main drain piping.
- I. Connect incoming power to skid mounted fire pump.

3.9 FIELD QUALITY CONTROL

- A. Flush, test, and inspect sprinkler piping systems in accordance with NFPA 13.
- B. Replace piping system components that do not pass the test procedures specified, and retest repaired portion of the system.

3.10 COMMISSIONING

- A. Sprinkler Systems: Test per NFPA 13, NFPA 25 and local authorities requirements. Submit Contractor's Material & Test Certificates for Above Ground Piping. Submit certificates of completion to Authority Having Jurisdiction and Owner. :
 - 1. After completion of all installation, tests, etc., and prior to the opening date, the Sprinkler Subcontractor shall instruct the building personnel in the operation of the sprinkler system. Special care shall be taken to make sure the building personnel:
 - a. Will immediately recognize whether the monitoring zone gate valves are in an Open position or a Closed position.
 - b. Will know how to drain the system.
 - c. Will know how to test the flow switches and alarm system.
 - d. Will know how to make complete weekly inspection.
 - e. Will know how to perform periodic maintenance of the Fire Sprinkler System.
- B. Fire Pump Systems: Sprinkler Contractor shall ensure that all items are properly installed, and the system is ready for acceptance test when scheduled, including, but not limited to power connection and the fire pump equipment listed in Part 2. Sprinkler Contractor shall provide fire pump test equipment, including multiple hoses, playpipe,

tachometer, and calibrated gauges. Fire Pump Skid Manufacturer shall provide qualified personnel necessary to conduct a full NFPA 20 acceptance test which includes, but is not limited to, flow (churn, 100%, and 150%), manual and automatic starts, etc. Sprinkler Contractor shall coordinate test with Fire Pump Skid Manufacturer, Contractor and Fire Protection Consultant and shall be on site during test. Verify flushing and prestart preparation prior to test. Typically, this is the first test in the Acceptance Test.

- C. Fire Alarm Equipment: Test per NFPA 25, NFPA 72 and local authorities' requirements in the presence of the Owner. Submit certificates of completion to Authority Having Jurisdiction and Owner.
- D. Backflow Preventer: Test per local authorities' requirements and submit certificates of completion to Authority Having Jurisdiction and provide Owner copies of the certificates.

END OF SECTION 211000

SECTION 215100 - TESTING REQUIREMENTS AND COMPLETION FORM

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORMED AND PASSED
211000.3.8.A	Flush, test, and inspect sprinkler piping systems in accordance with NFPA 13	Fire Protection Contractor	
211000.3.9.A	Sprinkler Systems: Test per NFPA 13, NFPA 25 and local authority's requirements. Submit Contractor's Material & Test Certificates for Above Ground Piping. Submit certificates of completion to Authority Having Jurisdiction and Owner. 1. After completion of all installation, tests, etc., and prior to the opening date, the Sprinkler Subcontractor shall instruct the building personnel in the operation of the sprinkler system. Special care shall be taken to make sure the building personnel: a. Will immediately recognize whether the monitoring zone gate valves are in an Open position or a Closed position. b. Will know how to drain the system. c. Will know how to test the flow switches and alarm system. d. Will know how to make complete weekly inspection. e. Will know how to perform periodic maintenance of the Fire Sprinkler System.	Fire Protection Contractor	
211000.3.9.B	Fire Alarm Equipment: Test per NFPA 25, NFPA 72 and local authority's requirements in the presence of the Owner. Submit certificates of completion to Authority Having Jurisdiction and Owner	Fire Protection Contractor	
211000.3.9.C	Backflow Preventer: Test per local authority's requirements and submit certificates of completion to Authority Having Jurisdiction and provide Owner copies of the certificates	Fire Protection Contractor	

END OF SECTION 215100

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SECTION 220010 - GENERAL PLUMBING REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Division requires the furnishing and installing of complete functioning systems, and each element thereof, as specified or indicated on the Drawings and Specifications or reasonably inferred; including every article, device or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- B. Contractor to coordinate delivery, receive & warranty Owner furnished items. The Contractor's warranty to include material & installation for a one-year term from Store turn over
- C. Division 22 of the Specifications and Drawings numbered with prefixes P, MP and EP generally describe these systems, but the scope of the Plumbing work includes all such work indicated in the Contract Documents: Instructions to Bidders; Proposal Form; General Conditions; Supplementary General Conditions; Architectural, Structural, Plumbing, Plumbing and Electrical Drawings and Specifications; and Addenda.
- D. The Drawings have been prepared diagrammatically intended to convey the scope of work, indicating the intended general arrangement of the equipment, fixtures, piping, etc. without showing all the exact details as to elevations, offsets, control lines, and other installation requirements. The Contractor shall use the Drawings as a guide when laying out the work and shall verify that materials and equipment will fit into the designated spaces, and which, when installed per manufacturers requirements, will ensure a complete, coordinated, satisfactory and properly operating system.

1.02 QUALITY ASSURANCE

- A. Execute all Work under this Division in a thorough and professional manner by competent and experienced workmen duly trained to perform the Work specified.
- B. Install all Work in strict conformance with all manufacturers' requirements and recommendations unless these Documents exceed those requirements. Install all equipment and materials in a neat and professional manner, aligned, leveled, and adjusted for satisfactory operation, in accordance with NECA guidelines.
- C. Unless indicated otherwise on the Drawings, provide all material and equipment new, of the best quality and design, free from defects and imperfections and with markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size, and capacity. Provide all material and equipment of the same type from the same manufacturer whenever practicable.
- D. Unless specified otherwise, manufactured items of the same types specified within this Division shall have been installed and used, without modification, renovation, or repair for not less than one year prior to date of bidding for this Project.

1.03 CODES, REFERENCES AND STANDARDS

- A. Execute all Work in accordance with National Fire Protection Association (NFPA) codes, state and local building codes, and all other applicable codes and ordinances in force, governing the particular class of Work involved, for performance, workmanship, equipment, and materials. Additionally, comply with rules and regulations of public utilities and municipal departments affected by connection of services. Where conflicts between various codes, ordinances, rules, and regulations exist, comply with the most stringent. Wherever requirements of these Specifications, Drawings, or both, exceed those of the above items, the requirements of these Specifications, Drawings, or both, shall govern. Code compliance, at a minimum, is mandatory. Construe nothing in these Construction Documents as permitting work not in compliance, at a minimum, with these codes. Bring all conflicts observed between codes, ordinances, rules, regulations and these documents to the Architect's and Engineer's attention in sufficient time, prior to the opening of Bids, to prepare the Supplementary Drawings and Specifications Addenda required to resolve the conflict.
- B. If the conflict is not reported timely, prior to the opening of bids, resolve the conflict and provide the installation in accordance with the governing codes and to the satisfaction of the Architect and Engineer, without additional compensation. Contractor will be held responsible for any violation of the law.
- C. Obtain timely inspections by the constituted authorities having jurisdiction; and, upon final completion of the Work, obtain and deliver to the Owner executed final certificates of acceptance from these authorities having jurisdiction.
- D. All material, manufacturing methods, handling, dimensions, methods of installation and test procedures shall conform to industry standards, acts, and codes, including, but not limited to the following, except where these Drawings and Specifications exceed them:

IBC	International Building Code
IMC	International Mechanical Code
IPC	International Plumbing Code
UPC	Uniform Plumbing Code
IECC	International Energy Conservation Code
IFC	International Fire Code
IFGC	International Fuel Gas Code
ADA	Americans with Disabilities Act
AIA	Guidelines for Design and Construction of Hospital and Healthcare Facilities
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute
ASHRAE	American Society of Heating Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society of Testing Materials
AWS	American Welding Society
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
NBFU	National Board of Fire Underwriters

NEC	National Electrical Code, NFPA 70
NFPA	National Fire Protection Association
NEMA	National Electrical Manufacturer's Association
OSHA	Occupational Safety and Health Act
PDI	Plumbing and Drainage Institute
UL	Underwriter's Laboratories

- E. Comply with rules and regulations of public utilities and municipal departments affected by connections of services.
- F. Perform all plumbing work in compliance with applicable safety regulations, including OSHA regulations. All safety lights, guards, and warning signs required for the performance of the plumbing work shall be provided by the Contractor.
- G. Obtain and pay for all permits, licenses and fees that are required by the governing authorities for the performance of the plumbing work.

1.04 DEFINITIONS

- A. Whenever used in these Specifications or Drawings, the following terms shall have the indicated meanings:
 - 1. Furnish: "To supply and deliver to the project site, ready for unloading, unpacking, assembling, installing, and similar operations."
 - 2. Install: "To perform all operations at the project site, including, but not limited to, and as required: unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, testing, commissioning, starting up and similar operations, complete, and ready for the intended use."
 - 3. Provide: "To furnish and install complete, and ready for the intended use."
 - 4. Furnished by Owner (or Owner-Furnished) or Furnished by Others: "An item furnished by the Owner or under other Divisions or Contracts and installed under the requirements of this Division by the job Contractor, complete, and ready for the intended use, including all items and services incidental to the Work necessary for proper installation and operation. Include the installation under the warranty required by this Division."
 - 5. Engineer: Where referenced in this Division, "Engineer" is the Engineer of Record and the Design Professional for the Work under this Division, and is a Consultant to, and an authorized representative of, the Architect, as defined in the General and/or Supplementary Conditions. When used in this Division, it means increased involvement by, and obligations to, the Engineer, in addition to involvement by, and obligations to, the "Architect".
 - 6. AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the Work.
 - 7. NRTL: Nationally Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA, etc.), and acceptable to the Authority having Jurisdiction (AHJ) over this project. Nationally Recognized Testing Laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ, and standards that meet the specified criteria.

- B. The terms “approved equal,” “equivalent” or “equal” are used synonymously and shall mean “accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified”. The term “approved” shall mean labeled, listed or both, by an NRTL and acceptable to the AHJ over this project.
- C. The following definitions apply to excavation operations:
 - 1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.
 - 2. Subbase: as used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.
 - 3. Subgrade: as used in this Section refers to the compacted soil immediately below the slab or pavement system.
 - 4. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Architect.

1.05 COORDINATION

- A. Visit the site and ascertain the conditions to be encountered in installing the Work under this Division, verify all dimensions and locations before purchasing equipment or commencing work, and make due provisions for same in the bid. Failure to comply with this requirement shall not be considered justification for omission, alteration, and incorrect or faulty installation of any of the Work under this Division or for additional compensation for any Work covered by this Division.
- B. Refer to Drawings and Divisions of the other trades and to relevant equipment drawings and shop drawings to determine the extent of clear spaces. Make all offsets required to clear equipment, beams, and other structural members, and to facilitate concealing conduit in the manner anticipated in the design.
- C. Provide materials with trim that will fit properly the types of ceiling, wall, or floor finishes actually installed.
- D. The contractor shall maintain a foreman on the jobsite at all times to coordinate his work with other contractors and subcontractors so that various components of the plumbing systems will be installed at the proper time, will fit in the available space, and will allow proper service access to the equipment. Carry on the work in such a manner that the work of the other contractors and trades will not be handicapped, hindered, or delayed at any time.
- E. Work of this Division shall progress according to the “Construction Schedule” as established by the Prime Contractor and his subcontractors and as approved by the Owner. Cooperate in establishing these schedules and perform the work under this Division in a timely manner in conformance with the construction schedule so as to insure successful achievement of schedule dates.

1.06 MEASUREMENTS AND LAYOUTS

- A. The Drawings are schematic in nature but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the Work. Figured dimensions take precedence to scaled dimensions. Determine exact locations by job measurements, by checking the requirements of other trades, and by reviewing all Contract Documents. Correct, at no additional costs to the Owner, errors that could have been avoided by proper checking and inspection.

1.07 SUBMITTALS

- A. Refer to Division 01 and General Conditions for submittal requirements.
- B. Assemble and submit for review, manufacturers product literature for material and equipment to be furnished, installed, or both, under this Division, including shop drawings, manufacturers' product data and performance sheets, samples, and other submittals required by this Division.
- C. Shop drawings shall be submitted for plumbing fixtures, equipment and major components of the plumbing systems in sufficient detail so as to demonstrate compliance with these Contract Documents and the design concept. Highlight, mark, list or indicate the materials, performance criteria and accessories that are being proposed.
- D. Refer to individual Sections for additional submittal requirements.
- E. Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus to/from mailing time via the Architect, plus a duplication of this time for resubmittals, if required. Transmit submittals as soon as possible after Notice to Proceed and before construction starts.
- F. Before transmitting submittals and material lists, verify that the equipment submitted is mutually compatible with and suitable for the intended use. Verify that the equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- G. Submittals shall contain the following information. Submittals not so identified will be returned to the Vendor without action:
 - 1. The project name.
 - 2. The applicable Specification Section and paragraph.
 - 3. Equipment identification acronym as used on the drawings.
 - 4. The submittal date.
 - 5. The Contractor's stamp, which shall certify that the stamped drawings have been checked by the Contractor, comply with the Drawings and Specifications, and have been coordinated with other trades.

- H. The Engineer's checking and subsequent acceptance of such submittals shall not relieve the Vendor from responsibility for deviations from Drawings or Specifications unless Vendor has, in writing, called the Engineer's and Architect's attention to such deviations at the time of submission, and secured written acceptance; nor shall it relieve Vendor from responsibility for errors in dimensions, details, sizes of members, or quantities; or for omissions of components or fittings; or for not coordinating items with actual building conditions and adjacent work.

1.08 ELECTRONIC DRAWINGS FILES

- A. In preparation of shop drawings or record drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DXF format from the Engineer. Contact the Architect for Architect's written authorization. In addition to payment, Architect's written authorization and data licensing agreement form must be received before electronic drawing files will be sent.
 - 1. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - 2. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
 - 3. Unless otherwise specified in writing, a check made payable to pb2 Architecture + Engineering. For a shipping and handling fee of \$200 for a drawing set up to 12 sheets and \$15 per sheet for each additional sheet shall accompany the request for files.
 - 4. Contractor shall indicate the desired shipping method and drawing format with the request.

1.09 SUBSTITUTIONS

- A. Refer to Bid Documents, General and Supplementary Conditions and Division 01 Specification Sections for limitations and restrictions on substitutions.
- B. Materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by the proposed substitution.
- C. No substitutions will be considered with receipt of Bids unless the Architect and Engineer have received from the Vendor a written request for approval to bid a substitution at least ten calendar days prior to the date for receipt of Bids and have approved the substitution request. Include, with each such request, the name of the material or equipment for which substitution is being requested, and a complete description of the proposed substitution, including drawings, cut sheets, performance and test data, and all other information necessary for an evaluation. Include also a statement setting forth changes in other materials, equipment or other work that would be required to incorporate the substitution. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's or Engineer's decision to approve or disapprove a substitution in a Bid is final.
- D. If the proposed substitution is approved prior to receipt of Bids, such approval will be stated in an Addendum. Bidders shall not rely upon approvals made in any other manner, including verbal.

- E. No substitutions will be considered after receipt of Bids and before award of the Contract.
- F. No substitutions will be considered after the Contract is awarded unless specifically provided in the Contract Documents.

1.010 OPERATION AND MAINTENANCE MANUALS

- A. Submit manual prior to requesting the final punch list.
- B. Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division.
- C. At the completion of the project, furnish to the Architect for the Owner, four (4) copies of brochures in three-ring, loose-leaf, hard-back notebook form, divided and tabbed, containing equipment data, approved shop drawings, diagrams, capacities, spare part numbers, manufacturer's service and maintenance data, warranties, guarantees, etc. Include local contacts complete with address and telephone number for equipment, apparatus and system components furnished and installed under this Division of specifications.

1.011 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish spare parts and extra materials specified in the individual sections of this Division and as specified in Section 017700.

1.012 RECORD DRAWINGS

- A. Keep a set of jobsite work prints of the Issued for Construction Drawings on the jobsite during construction, for the purpose of annotating changes. During the course of construction, indicate on these Documents, changes made from the Conformed Contract Documents. Pay particular attention to those items that require locating for servicing.
- B. At the completion of the project, incorporate changes noted on the jobsite work prints onto a complete set of Drawings to serve as Record Drawings. Mark each sheet "Record Drawing", along with the date, and deliver these Record Drawings to the Architect as outlined in Drawings in Division 01, Section "Project Record Documents".

1.013 TRAINING

- A. Provide training as indicated in each specific section. Schedule training with the owner at least 7 days in advance. Video tape the training session in format as agreed to with the Owner. Provide three copies of each session to the Owner and obtain written receipt from the Owner.

1.014 PAINTING

- A. Exposed ferrous surfaces, including pipe, pipe hangers, equipment stands and supports and exposed insulated piping shall be painted using materials and methods as specified under Division 9 of the Specifications; colors shall be as selected by the Architect.

- B. Factory finishes, shop priming and special finishes are specified in the individual equipment specification sections.
- C. Where factory finishes are provided and no additional field painting is specified, marred or damaged surfaces shall be touched up or refinished so as to leave a smooth, uniform finish.

1.015 DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 01 and General Conditions for Delivery, Storage and Handling.
- B. Deliver equipment and material to the job site in their original containers with labels intact, fully identified with manufacturer's name, make, model, model number, type, size, capacity and Underwriter's Laboratories, Inc. labels and other pertinent information necessary to identify the item.
- C. Deliver, receive, handle and store equipment and materials at the job site in the designated area and in such a manner as to prevent equipment and materials from damage and loss. Store equipment and materials delivered to the site on pallets and cover with waterproof, tear resistant tarp or plastic or as required to keep equipment and materials dry. Follow manufacturer's recommendations, and at all times, take every precaution to properly protect equipment and material from damage, including the erection of temporary shelters to adequately protect equipment and material stored at the Site. Equipment and/or material which becomes rusted or damaged shall be replaced or restored by the Contractor to a condition acceptable to the Architect and Engineer.
- D. The Contractor shall be responsible for the safe storage of his own tools, material and equipment.

1.016 GUARANTEES AND WARRANTIES

- A. Refer to Division 01 and General Conditions for Warranties.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- C. Warrant each system and each element thereof against all defects due to faulty workmanship, design or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty in these Construction Documents or manufacturer's standard warranty exceeds 12 months. Remedy all defects, occurring within the warranty period(s), as stated in the General Conditions and Division 01
- D. Also warrant the following additional items:
 - 1. Piping shall be free of obstructions, holes or breaks of any nature.
 - 2. Insulation shall be effective.
 - 3. Proper circulation of fluid in each piping system.
- E. The above warranties shall include labor and material. Make repairs or replacements without any additional costs to the Owner.

- F. Perform the remedial work promptly, upon written notice from the Architect or Owner.
- G. At the time of Substantial Completion, deliver to the Owner all warranties, in writing and properly executed, including term limits for warranties extending beyond the one year period, each warranty instrument being addressed to the Owner and stating the commencement date and term.

1.017 TEMPORARY FACILITIES

- A. Refer to Division 01 and General Conditions for Temporary Facilities requirements.
- B. Temporary Utilities: The types of services required include, but are not limited to, water, sewerage, surface drainage and gas. When connecting to existing franchised utilities for required services, comply with service companies' recommendations on materials and methods, or engage service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations.
 - 1. Water: Premises are supplied with water services which may be used in this work: Contractor shall make his own arrangements for water services.
 - 2. If premises are not supplied with water services, provide the necessary backflow prevention devices where connecting to the potable water system. Protect water service from freezing by draining system or by providing adequate heat. Where non-potable water is used, mark each outlet with health hazard warning signs.
 - 3. Sewer Sediment: Maintain sewers and temporary connecting sewers in a clean, non-clogged condition during construction period.
- C. Construction Facilities: Provide facilities reasonably required to perform construction operations properly and adequately.
 - 1 Enclosures: When temporary enclosures are required to ensure adequate workmanship, weather protection and ambient conditions required for the work, provide fire-retardant treated lumber and plywood; provide tarpaulins with UL label and flame spread of 15 or less; provide translucent type (nylon reinforced polyethylene) where daylighting of enclosed space would be beneficial for workmanship, and reduce use of temporary lighting.
 - 2 Heating: Provide heat, as necessary, to protect work, materials, and equipment from damage due to dampness and cold. In areas where building is occupied, maintain a temperature not less than 65 degrees F. Use steam, hot water, or gas from piped distribution system where available. Where steam, hot water or piped gas are not available, heat with self-contained LP gas or fuel oil heaters, bearing UL, FM or other approval labels appropriate for application. Vent fuel-burning heaters and equip units with individual-space thermostatic controls. Use electric-resistance space heaters only where no other, more energy-efficient, type of heater is available and allowable.

1.018 PROJECT CONDITIONS

- A. Conditions Affecting Excavations: The following project conditions apply:
 - 1. Maintain and protect existing building services that transit the area affected by selective demolition.

2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations.
- B. Site Information: Subsurface conditions were investigated during the design of the Project. Reports of these investigations are available for information only; data in the reports are not intended as representations or warranties of accuracy or continuity of conditions. The Owner will not be responsible for interpretations or conclusions drawn from this information.
- C. Use of explosives is not permitted.
- D. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits specified by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

- A. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.
- B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2-inch sieve, and not more than 5 percent passing a No. 4 sieve.
- C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP; free of clay, rock, or gravel larger than 2 inches in any dimension; debris; waste; frozen materials; and vegetable and other deleterious matter.

PART 3 EXECUTION

3.01 PERMITS

- A. Secure and pay for permits required in connection with the installation of the Plumbing Work. Arrange with the various utility companies for the installation and connection of required utilities for this facility and pay charges associated therewith including connection charges and inspection fees, except where these services or fees are designated to be provided by others

3.02 EXISTING UTILITIES

- A. Schedule and coordinate with the Utility Company, Owner and with the Engineer connection to, or relocation of, or discontinuation of normal utility services from existing utility lines. Premium time required for any such work shall be included in the bid.

- B. Existing utilities damaged due to the operations of utility work for this project shall be repaired to the satisfaction of the Owner or Utility Company without additional cost.
- C. Utilities shall not be left disconnected at the end of a workday or over a weekend unless authorized by representatives of the Owner or Engineer.
- D. Repairs and restoration of utilities shall be made before workmen leave the project at the end of the workday in which the interruption takes place.
- E. Contractor shall include in his bid the cost of furnishing temporary facilities to provide services during interruption of normal utility service.

3.03 EXCAVATION AND BACKFILLING

- A. Refer to Division 1, Division 31 and General Conditions for Excavation and Backfilling.
- B. Perform excavation of every description, of whatever substance encountered and to the depth required in connection with the installation of the work under this Division. Excavation shall be in conformance with applicable Division and section of the General Specifications.
- C. Roads, alleys, streets and sidewalks damaged during this work shall be restored to the satisfaction of Authorities Having Jurisdiction.
- D. Trenches close to walks or columns shall not be excavated without prior consultation with the Architect.
- E. The Contractor shall erect barricades around excavations, for safety, and shall place an adequate number of amber lights on or near the work and shall keep them burning from dusk to dawn. The Contractor shall be held responsible for any damage that any parties may sustain in consequence of neglecting the necessary precautions in prosecuting the work.
- F. Slope sides of excavations to comply with local, state, and federal codes and ordinances. Shore and brace as required for stability of excavation.
- G. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local, state and federal codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.
 - 1. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.
- H. Install sediment and erosion control measures in accordance with local codes and ordinances.
- I. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

- J. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
1. Locate and retain soil materials away from edge of excavations. Do not store within dripline of trees indicated to remain.
 2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.
- K. Trenching: Excavate trenches for Plumbing installations as follows:
1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of pipe and equipment.
 2. Excavate trenches to depth indicated or required for piping to establish indicated slope and invert elevations. Beyond building perimeter, excavate trenches to an elevation below frost line.
 3. Limit the length of open trench to that in which pipe can be installed, tested, and the trench backfilled within the same day.
 4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of pipe. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and pipe.
 5. Excavate trenches for piping and equipment with bottoms of trench to accurate elevations for support of pipe and equipment on undisturbed soil.
 - a. For pipes or equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom 1/4 of the circumference. Fill unevenness with tamped sand backfill. At each pipe joint over-excavate to relieve the bell or pipe joint of the pipe of loads, and to ensure continuous bearing of the pipe barrel on the bearing surface.
- L. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.
- M. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.
1. Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.
 2. Under building slabs, use drainage fill materials.
 3. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
 4. For piping less than 30 inches below surface of roadways, provide 4-inch-thick concrete base slab support. After installation and testing of piping, provide a 4-inch-thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.
 5. Other areas used excavated or borrowed materials.
- N. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval, and locations of underground utilities have been recorded.
 2. Removal of concrete formwork.
 3. Removal of shoring and bracing and backfilling of voids.
 4. Removal of trash and debris.
- O. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- P. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- Q. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of piping and equipment by carrying material uniformly around them to approximately same elevation in each lift.
- R. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.
1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
 - a. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
 - b. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
 - c. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.
 2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.
- S. Subsidence: Where subsidence occurs at Plumbing installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality and condition of surface or finish to match adjacent areas.

3.04 CUTTING AND PATCHING

- A. The Contractor shall do necessary cutting of walls, floors, ceilings and roofs.
- B. No structural member shall be cut without permission from Architect.
- C. Patch around openings to match adjacent construction.
- D. After the final waterproofing membrane has been installed, roofs may be cut only with written permission by the Architect.

3.05 CLEANING

- A. Dirt and refuse resulting from the performance of the work shall be removed from the premises as required to prevent accumulation. The Contractor shall maintain reasonably clean premises at all times.
- B. Immediately prior to the final inspection, the Contractor shall clean material and equipment. Dirt, dust, plaster, stains, and foreign matter shall be removed from surfaces including components internal to equipment. Damaged finishes shall be touched-up and restored to their original condition.

3.06 SUBSTANTIAL COMPLETION REVIEW

- A. Prior to requesting inspection for "CERTIFICATE OF SUBSTANTIAL COMPLETION", the Contractor shall complete the following items:
 - 1. Submit complete Operation and Maintenance Manuals.
 - 2. Submit complete Record Drawings.
 - 3. Perform special inspections. Refer to Table 3 at the end of this section for a list of specification sections in Division 22 that contain special inspection requirements.
 - 4. Start-up testing of systems.
 - 5. Removal of temporary facilities from the site.
 - 6. Comply with requirements for Substantial Completion in the "General Conditions".
- B. The Contractor shall request in writing a review for Substantial Completion. The Contractor shall give the Architect/Engineer at least seven (7) days notice prior to the review.
- C. The Contractor's written request shall state that the Contractor has complied with the requirements for Substantial Completion.
- D. Upon receipt of a request for review, the Architect/Engineer will either proceed with the review or advise the Contractor of unfulfilled requirements.
- E. If the Contractor requests a site visit for Substantial Completion review prior to completing the above-mentioned items, He shall reimburse the Architect/Engineer for time and expenses incurred for the visit.
- F. Upon completion of the review, the Architect/Engineer will prepare a "final list" of outstanding items to be completed or corrected for final acceptance.

- G. Omissions on the "final list" shall not relieve the Contractor from the requirements of the Contract Documents.
- H. Prior to requesting a final review, the Contractor shall submit a copy of the final list of items to be completed or corrected. He shall state in writing that each item has been completed, resolved for acceptance or the reason it has not been completed.

END OF SECTION

TABLE 2: SPECIAL WARRANTY REQUIREMENTS FOR PLUMBING EQUIPMENT

<u>Section Number/Title</u>		<u>Received Date/Initial</u>
223300	Electric, Domestic-Water Heaters	

TABLE 3: SPECIAL INSPECTION REQUIREMENTS FOR PLUMBING EQUIPMENT

	<u>Section Number/Title</u>	<u>Completed Date/Initial</u>
220548	Vibration & Seismic Controls for Plumbing Piping and Equipment	

SECTION 220015 - COORDINATION OF PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. This Section specifies the basic requirements for electrical components which are an integral part of packaged plumbing equipment. These components include, but are not limited to factory furnished motors, starters, and disconnect switches furnished as an integral part of packaged plumbing equipment.
- B. Specific electrical requirements (i.e. horsepower and electrical characteristics) for plumbing equipment are scheduled on the Drawings.
- C. System shall be complete and operational with power and control wiring provided to meet the design intent shown on the drawings and specified within the specification sections.

1.02 SUBMITTALS

- A. No separate submittal is required. Submit product data for motors, starters and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification Sections.

1.03 QUALITY ASSURANCE

- A. Electrical components and materials shall be UL labeled.
- B. All electrical equipment provided, and the wiring and installation of electrical equipment shall be in accordance with the requirements of this Section and Division 26.

PART 2 PRODUCTS

2.01 GENERAL

- A. The Contractors shall provide all motors, starters, disconnects, wire, conduit, etc. as specified in the Construction Documents. If, however, the Division 23 Contractor furnishes a piece of equipment requiring a different motor, starter, disconnect, wire size, etc. than what is shown and/or intended on the Construction Documents, this Trade shall coordinate the requirements with any other Trade and shall be responsible for any additional cost incurred by any other Trade that is associated with installing the different equipment and related accessories for proper working condition.
- B. Refer to Division 26, "Common Work Results for Electrical" for specification of motor connections.
- C. Refer to Division 26, "Enclosed Switches and Circuit Breakers" for specification of disconnect switches and enclosed circuit breakers.

PART 3 EXECUTION

3.01 CONTRACTOR COORDINATION

- A. Unless otherwise indicated, all motors, equipment, controls, etc. shall be furnished, set in place and wired in accordance with Table 1. Any items not listed but shown on the drawings shall be considered part of the Contract Documents and brought to the attention of the Architect.
- B. The Contractor is the central authority governing the total responsibility of all trade contractors. Therefore, deviations and clarifications of this schedule are permitted provided the Contractor assumes responsibility to coordinate the trade contractors different than as indicated herein. If deviations or clarifications to this schedule are implemented, submit a record copy to the Engineer.

ITEM	FURN BY	SET BY	POWER WIRING	CONTRO L WIRING
Equipment motors	DIV22	DIV22	DIV26	--
Factory furnished motor starters, contactors and disconnects	DIV22	DIV26	DIV26	DIV26
Loose motor starters, disconnect switches, thermal overloads and heaters.	DIV26	DIV26	DIV26	DIV26
Factory assembled control panels	DIV22	DIV26	DIV26	DIV26
Control relays and transformers	DIV22	DIV26	DIV26	DIV 26
Time switches	DIV22	DIV26	DIV26	DIV26
Motor and solenoid operated valves	DIV22	DIV22	DIV26	DIV26

DIV22 = Plumbing Trade

DIV26 = Electrical Trade

3.02 TABLE 1: ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT

END OF SECTION

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

PART 2 PRODUCTS

2.01 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.02 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel, Plastic, Stainless steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating or stainless steel of length required to secure pressure plates to sealing elements.

2.03 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; recommended for interior and exterior applications.

- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.01 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. Verify PVC sleeves are not prohibited by AHJ before installation.
- C. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- D. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- E. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- F. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.03 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves, Galvanized-steel-pipe sleeves, or PVC-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves or Galvanized-steel-pipe sleeves.
2. *Exterior Concrete Walls below Grade:*
 - a. Piping: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 2) For piping passing through or under foundation, sleeves shall be two nominal pipe sizes larger than the pipe served.
3. Concrete Slabs-on-Grade:
 - a. Piping: Cast-iron wall sleeves with sleeve-seal system or PVC-pipe sleeves.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
4. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION

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SECTION 220519 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Temperature gauges and fittings
 - 2. Pressure gauges and fittings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following but not limited to the following:
 - 1. Glass Tube Industrial Thermometers:
 - a. Marshalltown Instruments, Inc.
 - b. Miljoco Corporation.
 - c. Trerice, H. O. Co.
 - d. Weiss Instruments, Inc.
 - e. Weksler Instruments Corp.
 - f. Winters Instruments
 - 2. Pressure Gauges:
 - a. Ametek, U.S. Gauge Div.
 - b. Ashcroft Dresser Industries Instrument Div.
 - c. Ernst Gage Co.
 - d. Trerice, H. O. Co.
 - e. Marsh Instrument Co., Unit of General Signal.
 - f. Marshalltown Instruments, Inc.
 - g. Miljoco Corporation
 - h. Weiss Instruments, Inc.
 - i. Weksler Instruments Corp.
 - j. WIKA Instrument Corporation - USA.
 - k. Winters Instruments - U.S.
 - 3. Pressure Gauge Accessories: Same as for pressure gauges.

2.02 THERMOMETERS, GENERAL

- A. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.
- B. Scale Range: Temperature ranges for services listed as follows:
 - 1. Domestic Hot Water: 30 to 240 deg F with 2-degree scale divisions (0 to 115 deg C with 1-degree scale divisions).
 - 2. Domestic Cold Water: 0 to 100 deg F with 2-degree scale divisions (minus 18 to 38 deg C with 1-degree scale divisions).

2.03 GLASS TUBE INDUSTRIAL THERMOMETERS

- A. Case: die cast, aluminum finished, in baked epoxy enamel, glass front, spring secured, 9 inches long.
- B. Adjustable Joint: Finished to match case. 180-degree adjustment in vertical plan, 360-degree adjustment in horizontal plane, with locking device.
- C. Tube: Non-red color reading, non-toxic organic spirit-filled glass tube, magnifying lens.
- D. Scale: Satin-faced, nonreflective aluminum, with permanently etched markings.
- E. Stem: Copper-plated steel, aluminum or brass, for separable socket, length to suit installation.

2.04 PRESSURE GAGES

- A. Type: ASME B40.100.
- B. Case: Cast aluminum or stainless-steel case, glass lens; 4-1/2-inch (114-mm) nominal diameter.
- C. Connector: Brass, 1/4-inch NPS
- D. Scale: White coated aluminum, with permanently etched markings.
- E. Accuracy: Plus or minus 1 percent of range span.
- F. Range: Conform to the following:
 - 1. Vacuum: 30 inches Hg to 15 psi
 - 2. All fluids: 2 times operating pressure.
- G. Liquid-Filled: Provide liquid filled gauges where specified in Part 3 of this section.

2.05 PRESSURE GAGE ACCESSORIES

- A. Syphon: 1/4-inch NPS straight coil constructed of brass tubing with threads on each end.
- B. Snubber: 1/4-inch NPS brass bushing with corrosion-resistant porous metal disc. Disc material shall be suitable for fluid served and rated pressure.

PART 3 EXECUTION

3.01 THERMOMETER INSTALLATION

- A. Install thermometers in the following locations and elsewhere as indicated:
 - 1. Outlet of each domestic water heater.

3.02 PRESSURE-GAGE INSTALLATION

- A. Install pressure gauges in the following locations and elsewhere as indicated:
 - 1. At the discharge of each pressure-reducing valve.
 - 2. At building water service entrance.
- B. Pressure Gauge Needle Valves: Install in piping tee with snubber.

END OF SECTION

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SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes general duty valves common to most plumbing piping systems.
 - 1. Special purpose valves are specified in individual piping system specifications.

1.02 QUALITY ASSURANCE

- A. Single Source Responsibility: Comply with the requirements specified in Division 1 Section "MATERIALS AND EQUIPMENT," under "Source Limitations."
- B. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the manufacturers listed in the valve schedule.

2.02 VALVE FEATURES, GENERAL

- A. Valve Design: Rising stem or rising outside screw and yoke stems.
 - 1. Nonrising stem valves may be used where headroom prevents full extension of rising stems.
- B. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.
- C. Sizes: Same size as upstream pipe, unless otherwise indicated.
- D. Operators: Provide the following special operator features:
 - 1. Handwheels, fastened to valve stem, for valves other than quarter turn.
 - 2. Lever handles, on quarter-turn valves 6-inch and smaller, except for plug valves. Provide plug valves with square heads; provide one wrench for every 10 plug valves.

3. Chain-wheel operators, for valves 2-1/2-inch and larger, installed 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.
 4. Gear drive operators, on quarter-turn valves 8-inch and larger.
- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- G. End Connections: As indicated in the valve specifications.
1. Threads: Comply with ANSI B1.20.1.
 2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
 3. Solder-Joint: Comply with ANSI B16.18.
 - a. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for gate, globe, and check valves; below 421 deg F for ball valves.

2.03 BALL VALVES

- A. Ball Valves, 2-Inch and Smaller: MSS SP-110, 150 saturated steam pressure, 600-psi CWP; two-piece construction; with bronze body conforming to ASTM B 584, conventional port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, solder ends and vinyl-covered steel handle.
- B. Ball Valves, 2-1/2-inch to 3-inch: MSS SP-110, Class 150, 600-psi CWP; 3-piece construction; with bronze body conforming to ASTM B 584, conventional port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, solder ends and vinyl-covered steel handle.

2.04 BUTTERFLY VALVES

- A. Butterfly Valves, 2-1/2-Inch and Larger: MSS SP-67; 200-psi CWP; lug-type body constructed of cast-iron conforming to ASTM A 126, Class B or ductile iron conforming to ASTM A 536. Provide valves with field replaceable EPDM sleeve, nickel-plated ductile iron disc, stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks for sizes 2-1/2 through 6 inches and gear operators with position indicator for sizes 8 inch and larger. Drill and tap valves on dead-end service or requiring additional body strength. Valves must be rated for dead end service at 200 psi with no downstream flange required.

2.05 GATE VALVES

- A. Gate Valves, 3-Inch and Larger; MSS SP-70; Class 125 200-psi, iron body with bolted bonnet, flanged ends & bronze trim. Solid wedge Disc.

2.06 CHECK VALVES

- A. Swing Check Valves, 2-Inch and Smaller: MSS SP-80; Class 125, 200-psi CWP, cast-bronze body and cap conforming to ASTM B 62; with horizontal swing, Y-pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150, 300-psi CWP, valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.
- B. Swing Check Valves, 2-1/2-Inch and Larger: MSS SP-71; Class 125 200-psi CWP, (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, and bronze disc or cast-iron disc with bronze disc ring; and flanged ends. Provide valves capable of being refitted while the valve remains in the line.

PART 3 EXECUTION

3.01 VALVE ENDS SELECTION

- A. Select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size, 2-inch and Smaller: Solder ends.
 - 2. Copper Tube Sizes, 2-1/2-inch and Larger: Flanged end.

3.02 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

A. VALVES, 2-INCH AND SMALLER

<u>SERVICE</u>	<u>BALL</u>	<u>CHECK</u>
Domestic Hot and Cold Water	150	125

B. VALVES, 2-1/2-INCH AND LARGER

<u>SERVICE</u>	<u>BALL</u>	<u>BUTTERFLY</u>	<u>GATE</u>	<u>CHECK</u>
Dom. Hot & Cold Water	150	200	200	125

3.03 VALVE SCHEDULE

- A. Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.
 - b. DynaQuip Controls.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Watts; a Watts Water Technologies company.

B. Butterfly Valves -2-1/2 Inch and Larger:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products with nickel-plated ductile-iron disc that may be incorporated into the Work include, but are not limited to the following:
 - a. ABZ Valve and Controls.
 - b. American Valve, Inc.
 - c. Conbraco Industries, Inc.
 - d. Cooper Cameron Valves.
 - e. DeZURIK.
 - f. Flo Fab inc.
 - g. Hammond Valve.
 - h. Jenkins Valves; Crane Energy Flow Solutions.
 - i. Jomar Valve.
 - j. KITZ Corporation.
 - k. Legend Valve & Fitting, Inc.
 - l. Milwaukee Valve Company.
 - m. Mueller Steam Specialty.
 - n. NIBCO INC.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products with aluminum-bronze disc that may be incorporated into the Work include, but are not limited to the following:
 - a. ABZ Valve and Controls.
 - b. Conbraco Industries, Inc.
 - c. Cooper Cameron Valves.
 - d. DeZURIK.
 - e. Flo Fab inc.
 - f. Hammond Valve.
 - g. Jenkins Valves; Crane Energy Flow Solutions.
 - h. KITZ Corporation.
 - i. Legend Valve & Fitting, Inc.
 - j. Milwaukee Valve Company.
 - k. NIBCO INC.
 - l. Norriseal.
 - m. Red-White Valve Corporation.
 - n. Spence Strainers International.

C. Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane; Crane Energy Flow Solutions.
 - b. Flo Fab inc.
 - c. Hammond Valve.
 - d. Jenkins Valves; Crane Energy Flow Solutions.
 - e. KITZ Corporation.
 - f. Legend Valve & Fitting, Inc.

- g. Macomb Groups (The).
- h. Milwaukee Valve Company.
- i. NIBCO INC.
- j. Powell Valves.
- k. Red-White Valve Corporation.
- l. Stockham; Crane Energy Flow Solutions.
- m. Watts; a Watts Water Technologies company.
- n. Zurn Industries, LLC.

D. Swing Check Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane; Crane Energy Flow Solutions.
 - c. Hammond Valve.
 - d. Jenkins Valves; Crane Energy Flow Solutions.
 - e. KITZ Corporation.
 - f. Macomb Groups (The).
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Stockham; Crane Energy Flow Solutions.
 - l. Watts; a Watts Water Technologies company.

3.04 APPLICATION SCHEDULE

- A. General Application: Use ball, and butterfly valves for shutoff and for throttling duty. Refer to piping system Specification Sections for specific valve applications and arrangements. Use Gate valve as indicated in drawing for water service entry.
- B. Domestic Water Systems: Use the following valve types:
 - 1. Ball Valves: Class 150, 600-psi CWP, with stem extension.
 - 2. Butterfly Valves: Nickel-plated ductile iron, elastomer-coated ductile iron disc; EPDM or Buna N sleeve and stem seals.
 - 3. Bronze Swing Check: Class 125, with rubber seat.
 - 4. Check Valves: Class 125, Swing.

3.05 VALVE INSTALLATIONS

- A. Locate valves for easy access and provide separate support where necessary. Provide access doors as required.
- B. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

- C. Install three-valve bypass around each pressure reducing valve using throttling-type valves.
- D. Install valves in horizontal piping with stem at or above the center of the pipe.
- E. Install valves in a position to allow full stem movement.
- F. Installation of Check Valves: Install for proper direction of flow as follows:
 - 1. Swing Check Valves: Horizontal position with hinge pin level.

3.06 FIELD QUALITY CONTROL

- A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.07 ADJUSTING AND CLEANING

- A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.
- B. Inspect valves for leaks after piping systems have been tested and put into service, but before final adjusting and balancing. Adjust or replace packing, as required, on valves with leaks. Replace valve if leak persists.

END OF SECTION

SECTION 220529 - HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.
7. Pre-Engineered supports.

1.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.03 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.04 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.02 TRAPEZE PIPE HANGERS

- #### A.
- Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.03 THERMAL-HANGER SHIELD INSERTS

- #### A.
- Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- #### B.
- Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- #### C.
- For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- #### D.
- For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.04 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.05 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.06 EQUIPMENT SUPPORTS

- A. Description: Pre-engineered equipment platform made of galvanized steel.

2.07 PRE-ENGINEERED SUPPORTS

- A. Pre-engineered Support Strut Systems: Minimum 14-gauge galvanized steel with factory-punched attachment holes. Two-piece straps shall be captivated at the shoulder when attachment nut is tightened and designed for use with strut system. Long or short pipe rollers designed for use with strut system, where indicated, shall attach to the channel with brackets and nuts. All nuts, brackets and clamps shall have the same finish as the channels.
- B. Pre-Engineered Roof Pipe Supports: 4" x 4" x12" long closed cell polyethylene blocks with embedded pre-engineered support strut or pre-engineered support struts with factory plastic bases. Two-piece straps shall be captivated at the shoulder when attachment nut is tightened and designed for use with strut system. All nuts, brackets and clamps shall have the same finish as the channels. Include all necessary threaded rod risers and additional channel struts, nuts, brackets, and clamps to insure proper fall of piping system.
- C. Pre-Engineered

2.08 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. PEX-a Hangers and Support Installation

1. Horizontal PEX-a Piping Hangers: Install hangers suitable for PEX-a piping in compliance with the Uponor Commercial Piping Pocket Guide (2017) and local codes, with the following maximum spacing:
 - a. 3 inch (75mm) and below: Maximum span, 32 inches (0.81 m).
 - b. Note: The above maximum hanger spacing requirements may be extended with the use of a continuous support channel such as Uponor PEX-a Pipe Support.
2. Horizontal PEX-a Piping with PEX-a Pipe Channel: Install hangers for PEX-a piping with horizontal support channel in accordance with local jurisdiction and manufacturer's recommendations, with the following maximum spacing:
 - a. 3/4 inch (20 mm) and below: Maximum span, 6 feet (1.8 m)
 - b. 1 inch (25 mm) and above: Maximum span, 8 feet (2.4 m).
3. Vertical PEX-a Piping: Support PEX-a piping with maximum spacing of 5 feet (1.5 m).

B. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

C. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

- F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- N. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS

- A. Install pre-engineered equipment support systems per manufacturer's instructions.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.04 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.05 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.06 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 4. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Pre-engineered Support Strut Systems: Channel strut systems can be used at the Contractors option in lieu of individual hangers for horizontal pipes. Space channel strut systems at the required distance for the smallest pipe supported. Provide channel gauge and hanger rods per the manufacturer's recommendations for the piping supported.

- M. Pre-Engineered Roof Pipe Supports: Set supports on an 24" X 24" x 3/16" thick roof walkway material compatible with the roof material.
- N. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- O. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- P. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- Q. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.

- 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
- R. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- S. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- T. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Open-spring isolators.
 - 2. Spring hangers.
 - 3. Seismic-restraint accessories.

1.02 ACTION SUBMITTALS

- A. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.
 - 1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.03 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

1.04 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: [A] [B] [C] [D] [E] [F].
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: [I] [II] [III].
 - a. Component Importance Factor: [1.0] [1.5] <Insert value>.
 - b. Component Response Modification Factor: [1.5] [2.5] [3.5] [5.0] <Insert value>.
 - c. Component Amplification Factor: [1.0] [2.5] <Insert value>.
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): <Insert number>.
4. Design Spectral Response Acceleration at 1.0-Second Period: <Insert number>.

2.02 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amber Booth.
 - b. California Dynamics Corporation.
 - c. Kinetics Noise Control, Inc.
 - d. Mason Industries, Inc.
 - e. Vibration Eliminator Co., Inc.
 - f. Vibration Mountings & Controls, Inc.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.03 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

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

- a. Amber Booth.
 - b. California Dynamics Corporation.
 - c. Kinetics Noise Control, Inc.
 - d. Mason Industries, Inc.
 - e. Vibration Eliminator Co., Inc.
 - f. Vibration Mountings & Controls, Inc.
2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
 9. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.04 SEISMIC-RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. Cooper B-Line, Inc.; a division of Cooper Industries.
 2. Kinetics Noise Control, Inc.
 3. Mason Industries, Inc.
 4. TOLCO.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 EXECUTION

3.01 APPLICATIONS

- A. In-line Pumps shall be supported by Open-spring isolators or Spring hangers. Provide flexible pipe couplings on each side of pump. The vertical load shall be carried by the supports, not by the flexible connectors.
- B. Piping support with Open-spring isolators or Spring hangers within 15 ft of in-line pump.
- C. All equipment, piping, etc. shall be suspended from approved supports, all as specified herein, or as shown on the drawings.
- D. Furnish and install neoprene mounting sleeves for hold-down bolts to prevent any metal-to-metal contact.
- E. All equipment shall be provided with lateral restraining isolators as required to limit horizontal motion to 1/4" maximum, under all operating conditions. Lateral restraining isolators shall have the same static deflection as the vertical isolators for the equipment being isolated.
- F. Piping or plumbing equipment shall be supported from building structure, not hung from, or supported on other equipment, pipes, or ductwork.
- G. Equipment connected to water or other fluid piping shall be erected on isolators or isolated foundations at correct operating heights prior to connection of piping and blocked-up with temporary shims to final operating height. When the system is assembled and fluid is added, the isolators shall be adjusted to allow removal of the shims.
- H. All plumbing equipment not specifically identified in this specification that contains rotating or vibrating elements, and any associated electrical apparatus installed by this division that contains transformers or inductors shall be installed on neoprene isolators as appropriate.
- I. All wiring connections to plumbing equipment on isolators shall be made with a minimum 18-inch-long flexible conduit in a "U" shaped loop.
- J. Elastomeric isolators that will be exposed to temperatures below 32 degrees F shall be fabricated from natural rubber instead of neoprene.
- K. Springs shall be designed and installed so that ends of springs remain parallel and all springs installed with adjustment bolts.
- L. Springs shall be sized to be non-resonant with equipment forcing frequencies or support structure natural frequencies.
- M. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES, OSHPD, or by an agency acceptable to authorities having jurisdiction.

- N. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where required to prevent buckling of hanger rods due to seismic forces.
- O. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.02 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- D. Equipment Restraints:
 - 1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Brace a change of direction longer than 12 feet.
- F. Install cables so they do not bend across edges of adjacent equipment or building structure.
- G. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

K. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.03 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 221116 "Domestic Water Piping" for piping flexible connections.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 4. Test to 90 percent of rated proof load of device.
 5. Measure isolator restraint clearance.
 6. Measure isolator deflection.
 7. Verify snubber minimum clearances.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.05 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.02 SPARE PARTS AND EXTRA MATERIALS

A. Furnish extra materials as specified in Section 017700.

B. Furnish minimum of 5% extra stock of each mechanical identification material required, including additional numbered valve tags (not less than 3) for each piping system, additional piping system identification markers, and additional plastic laminate engraving blanks of assorted sizes.

1. Where stenciled markers are provided, clean and retain stencils after completion of stenciling and include used stencils in extra stock, along with required stock of stenciling paints and applicators.

PART 2 PRODUCTS

2.01 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allen Systems, Inc.
 - b. Brady Corporation.
 - c. Industrial Safety Supply Co. Inc.
 - d. Seton Identification Products.
2. Material and Thickness: Brass, 0.032-inch stainless steel, 0.025-inch aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2-inch by 3/4-inch.
4. Minimum Letter Size: 1/4-inch for name of units if viewing distance is less than 24 inches, 1/2-inch for viewing distances up to 72 inches, and proportionately larger

lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allen Systems, Inc.
 - b. Brady Corporation.
 - c. Industrial Safety Supply Co. Inc.
 - d. Seton Identification Products.
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch thick, and having predrilled holes for attachment hardware.
3. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2-inch by 3/4-inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 WARNING SIGNS AND LABELS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allen Systems, Inc.
 - b. Brady Corporation.
 - c. Industrial Safety Supply Co. Inc.
 - d. Seton Identification Products.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

- C. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- D. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2-inch by 3/4-inch.
- E. Minimum Letter Size: 1/4-inch for name of units if viewing distance is less than 24 inches, 1/2-inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- F. Fasteners: Stainless-steel rivets or self-tapping screws.
- G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- H. Label Content: Include caution and warning information plus emergency notification instructions.

2.03 PIPE LABELS

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allen Systems, Inc.
 - b. Brady Corporation.
 - c. Industrial Safety Supply Co. Inc.
 - d. Seton Identification Products.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- C. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: Size letters according to ASME A13.1 for piping.

PART 3 EXECUTION

3.01 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.

- B. Locate equipment labels where accessible and visible.

3.02 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where the flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

END OF SECTION

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.
 - 2. Domestic recirculating hot-water piping.
 - 3. Domestic cold-water piping.
 - 4. Supplies and drains for handicap-accessible lavatories and sinks.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.03 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armacell LLC.
 - b. Babcock and Wilcox; Insulating Products Div.
 - c. Certainteed Corp.
 - d. Dow Chemical Co., Building Materials, Div.; Trymer 2000.
 - e. Knauf Insulation.
 - f. Manville Products Corp.
 - g. Nomaco, LLC.
 - h. Owens-Corning Corp.
 - i. Pittsburgh Corning Corp.
 - 2. Preformed Pipe Insulation with Factory-Applied ASJ or ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armacell LLC.
 - b. Babcock and Wilcox; Insulating Products Div.
 - c. Certainteed Corp.
 - d. Dow Chemical Co., Building Materials, Div.; Trymer 2000.
 - e. Knauf Insulation.
 - f. Manville Products Corp.
 - g. Nomaco, LLC.
 - h. Owens-Corning Corp.
 - i. Pittsburgh Corning Corp.
- H. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ or ASJ-

SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armacell LLC.
 - b. Babcock and Wilcox; Insulating Products Div.
 - c. Certainteed Corp.
 - d. Dow Chemical Co., Building Materials, Div.; Trymer 2000.
 - e. Knauf Insulation.
 - f. Manville Products Corp.

2.02 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.03 ADHESIVES, SEALANTS, AND MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Adhesives:
 1. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F
 2. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 3. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 4. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 5. PVC Jacket Adhesive: Compatible with PVC jacket.
- C. Mastics shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

2.04 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.05 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

2.06 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
- C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

2.07 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

2.08 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.

2.09 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers,
 - 1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 EXECUTION

3.01 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch-wide strips of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.03 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor

- insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.04 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids,

- and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover

- in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.05 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.06 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.07 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.08 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.09 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 1. Flat Acrylic Finish: finish coat over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.010 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Underground piping.
 - 2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.011 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot, Cold and Recirculated Hot Water: Insulation shall be one of the following:
 - 1. Flexible Elastomeric: 1 inch thick.
 - 2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.012 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Domestic Hot, Cold and Recirculated Hot Water: Insulation shall be one of the following:
 - 1. Cellular Glass: 2 inches thick.
 - 2. Flexible Elastomeric: 2 inches thick.
 - 3. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

- B. Condensate Piping Where Heat Tracing Is Installed: Insulation shall be one of the following:

- 1. Cellular Glass: 2 inches thick.
- 2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.013 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. PVC: 20 mils thick.
 - 2. Aluminum: 0.016 inch thick.
- D. Piping, Exposed:
 - 1. PVC: 20 mils thick.
 - 2. Aluminum: 0.016 inch thick.

3.014 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. PVC: 30 mils thick.
 - 2. Aluminum: 0.016 inch thick.
- D. Piping, Exposed:
 - 1. PVC: 30 mils thick.
 - 2. Aluminum: 0.016 inch thick.

END OF SECTION

SECTION 221111 - MECHANICALLY JOINED PLUMBING PIPING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. This Section only applies to grooved or press to connect mechanical piping for Plumbing applications as defined in Division Section 22 "Water Distribution Piping and Specialties".
- B. The Contractor may provide grooved, press to connect mechanical joints, couplings, fittings, valves and related components as an option in lieu of, in whole or in part, copper sweat, brazing, threaded or flanged piping methods. Grooved couplings may be used at equipment connections where specified for vibration isolation control only.
- C. Grooved, press to connect or mechanical joints, couplings, fittings, valves, and related components shall not be provided for natural gas piping in lieu of welded, threaded or flanged piping methods.
- D. This Section includes grooved mechanical pipe couplings, fittings, valves and other grooved components for use as an option to copper sweat, brazing, threading, or flanged methods.

1.02 QUALITY ASSURANCE

- A. All grooved or press to connect components shall be of one manufacturer and conform to local code approval.
- B. Grooved mechanical piping shall conform to local code approval and/or as listed by ANSI-B-31.1, B31.3, B-31.9, ASME, UL/ULC, FM, IAPMO or BOCA.
- C. Grooved, press to connect, and push to connect end product manufacturer shall be ISO certified.
- D. Grooved couplings shall meet the requirements of ASTM F-1476.
- E. Where required by local authorities, couplings, fittings and valves shall meet ANSI/NSF-61.

1.03 COORDINATION

- A. Reference Division 22 Section "Water Distribution Piping and Specialties" for coordination.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Press to Connect Copper Tubing System manufacturers recommend but not limited to:
 - 1. Viega, 17545 Daleview Dr., Lakewood, OH 44107, 877-620-0016; or Ridge Tool Company, 400 Clark Street, Elyria, OH 44035, 800-519-3456.
 - 2. NIBCO, Inc. 1516 Middlebury Street Elkhart, IN 46516-4740, 800.234.0227/574.295.3000.
 - 3. Elkhart Products Corporation, "XPRESS"

2.02 PRESS TO CONNECT COPPER TUBING SYSTEM

- A. Copper Tube: ASTM B-88 Type K or L.
- B. Couplings: ½" through 2" copper press to connect couplings with EPDM O-rings meeting ASME B16.18 or ASME B16.22.
- C. Fittings: ½" through 2" copper tube size fittings with copper press to connect couplings with EPDM O-rings meeting ASME B16.18 or ASME B16.22.
- D. Press to Connect Valves
 - 1. Ball Valves
 - a. Cast bronze body and end pieces with male or female press to connect ends meeting ASTM B584 Alloy C84400, rated at 200 PSI CWP to 250° F maximum, RTFE seats, blow out proof stem and chrome plated brass ball. Provide with 2" extended handles of non-thermal conductive material for insulated piping, ball valves shall be equipped with handle to have extended sleeve to allow valve operation without disturbing the insulation and with memory stop for throttling, metering or balancing service.
 - b. NIBCO PF585-70-66
 - c. Cimberio 225 Series
 - 2. Check Valves
 - a. Check Valves (Y pattern, swing type or in-line) with male or female press to connect ends shall be rated 200 PSI CWP to 250° F maximum. Valves shall be manufactured in accordance with MSS SP 80. Body and cap to be manufactured of dezincification resistant cast bronze (ASTM B 62). Valves to have TFE seat disc.
 - b. NIBCO PS 413-Y, PS480-Y, or PCM480-Y
 - c. Cimberio 80 series.

PART 3 EXECUTION

3.01 PIPING APPLICATIONS ABOVE GRADE

- A. Water piping in sizes 2-1/2 to 6 inches shall be Type L drawn copper tube with roll-grooved ends and copper tube dimensioned mechanical couplings and fittings or water piping sizes 2-1/2" to 4" shall be Type L drawn copper tube with plain ends and copper tube dimensioned press to connect fittings.
- B. Water piping in sizes 2 inches and smaller shall be Type L drawn copper tube with plain ends and copper tube dimensioned press to connect copper couplings and fittings.

3.02 PIPING INSTALLATION

- A. Water distribution piping installations shall be installed subject to Division 22 Section "Water Distribution Systems and Specialties" in addition to those requirements specified in this Section.
- B. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

3.03 HANGERS AND SUPPORTS

- A. Support of piping must account for expansion and contraction, vibration, and the dead load of the piping and its contents.
- B. General: Hanger supports, and anchors devices are specified in Division 22 Section "Hangers and Supports for Plumbing Piping." Reference Division 22 Section "Water Distribution Systems and Specialties" for pipe spacing limitations.

3.04 PIPE JOINT CONSTRUCTION

- A. Copper Grooved tubing System
 - 1. Verify gasket style and elastomeric material (grade) is suitable for the intended service as specified with latest published manufacturer's product data.
 - 2. Reference latest published manufacturer's product data for additional pressure ratings and application information.
 - 3. Reference latest published latest published manufacturer's field installation instructions or other included installation instructions prior to attempting assembly.
 - 4. Ream, debur and clean tube ends and verify they are free from indentations, projections and roll marks in the area from tube end to groove for proper gasket sealing.
 - 5. All grooved components (couplings, fittings, valves, gaskets, bolts and nuts) and all grooving tools shall be of one manufacturer (Victaulic).
 - 6. Install gaskets with lubricant suitable for all piping services. Lubricant shall be by one manufacturer (Victaulic).

B. Press to connect Copper Tubing System

1. Ream, debur and clean tube ends and verify they are free from indentations, projections, burrs and foreign matter.
2. Install permanent inspection mark on tube.
3. Clean tube and fittings of all dirt and oil. Verify O-ring is in place and free of oil, grease or dirt.
4. Push copper tube into fittings with twisting action to all the way to the fitting stop or shoulder.
5. Mark tube with permanent marker to indicate proper tube insertion depth.
6. Verify press tool has correct size jaw set for tube size used.
7. Complete one tool cycle with empty jaw to calibrate tool for each time new jaw is inserted into tool.
8. Squeeze jaw arms to open tool jaws and place jaws around the contour of the fitting. Verify tool is perpendicular to the fitting and depress tool switch.
9. Squeeze jaw open to remove the tool and observe witness mark.
10. Verify crimped fitting connection for misalignment of the copper tube, misalignment of the tool or improper insertion of the tube. If any of these conditions are found cut out the joint and provide a new joint.
11. Maintain minimum distance between joints per the manufacturer's published installation instructions.

3.05 VALVE APPLICATIONS

- A. Reference Division 22 Section "Water Distribution Piping and Specialties" for valve applications.

3.06 WATER DISTRIBUTION SPECIALTIES INSTALLATION

- A. Reference Division 22 Section "Water Distribution Systems and Specialties" for water distribution specialties and installation requirements.

3.07 FIELD QUALITY CONTROL

- A. The following procedures are paraphrased from the ASME B-31.9, code for pressure piping, building services piping.
- B. Installing contractor shall visually inspect couplings and repair or replace any misaligned couplings and couplings with gaps prior to calling for inspection as defined in Division 22 Section "General Plumbing Requirements."

3.08 STARTUP

- A. Refer to Division 22 Section "Water Distribution Piping and Specialties" for startup procedures.

END OF SECTION

SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for water service.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.02 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. NSF Compliance:
 - 1. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

1.04 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not proceed with interruption of water-distribution service without Construction Manager's or Owner's written permission.

1.05 COORDINATION

- A. Coordinate connection to water main with utility company.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
 - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- B. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
 - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

PART 3 EXECUTION

3.01 PREPARATION FOUNDATION FOR BELOW GRADE WATER DISTRIBUTION PIPE AND FITTINGS

- A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated invert elevation.
- C. Pipe Beds:
 - 1. Copper Tube: Provide 6" thick sand pipe bed underneath and around sides of pipe, up to middle half of the pipe, including fittings. Tamp bed with mechanical tamper to 85% to 95% compaction. Provide first layer of sand backfill 6" above pipe, tamp backfill with mechanical tamper to 85% to 95% compaction.
 - 2. Ductile Iron Pipe: Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation. Provide first layer of pea gravel backfill 6" above pipe, tamp backfill with mechanical tamper to 85% to 95% compaction. For piping with rock trench bottoms, provide sand pipe bed 6" underneath and around sides of pipe up to middle half of the pipe, including fittings.

- D. Provide backfill above top of pipe bed as required for field conditions. Refer to Division 22 Section "General Plumbing Requirements" for materials and methods for backfill.

3.02 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 2-1/2 shall be soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- F. Underground water-service piping NPS 3 and larger shall be the following:
 - 1. Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
- G. Aboveground Water-Service Piping shall be hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

3.03 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
- D. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration.
- E. Extend water-service piping and connect to water-supply source and building-water-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-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

- F. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- G. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- H. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.04 WATER METER AND BACKFLOW PREVENTER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company's written instructions.
- B. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- C. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- D. Do not install bypass piping around backflow preventers.
- E. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.05 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.06 IDENTIFICATION

- A. Install continuous underground warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping.

3.07 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

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SECTION 221116 - DOMESTIC WATER PIPING (REQUIRED VENDOR)

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.02 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall have successfully completed the Uponor Commercial Piping Systems Training Course (formerly Uponor AquaPEX Certification) and is able to provide proof/verification. Course shall be conducted by the manufacturer or a manufacturer's representative.

1.03 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
 - 1. Store PEX tubing in cartons or under cover to avoid dirt or foreign material from entering the tubing.
 - 2. Do not expose PEX tubing to direct sunlight for more than 30 days. IF construction delays are encountered, cover the tubing to prevent exposure to direct sunlight.

1.05 WARRANTY

- A. Manufacturer's Warranty: PEX-a manufacturer system warranty shall cover piping and fittings for a duration of 25 years from the date of installation. Piping system warranty shall apply to potable water distribution and water service systems constructed of pipe and fitting products sourced from the same manufacturer.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.02 COPPER TUBE AND FITTINGS

- A. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

2.03 PEX PIPE AND FITTINGS

- A. Manufacturers: Subject to compliance with requirement, provide products by the following:
 - 1. Uponor North America
- B. PEX-a (Engel-Method Crosslinked Polyethylene) Piping: ASTM F 876 and F877 (CAN/CSA-B137.5) by Uponor.
- C. PEX-a Fittings: elbows, adapters, couplings, plugs, tees and multi-port tees (1/2 inch through 3 inch nominal pipe size): ASTM F1960 cold-expansion fitting manufactured from the following material types:
 - 1. UNS No. C69300 Lead-free (LF) Brass.
 - 2. UNS No. C27453 Lead-free (LF) Brass.
 - 3. 20% glass-filled polysulfone as specified in ASTM D 6394.
 - 4. Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D 6394.
 - 5. Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D 6394.
 - 6. Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D 6394.
 - 7. Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked "F1960".
- D. Multi-Port Tees: Multiple-outlet fitting complying with ASTM F 877 (CAN/CSA B137.5); with ASTM F 1960 inlets and outlets.
 - 1. Engineered polymer branch multi-port tee.
 - 2. Engineered polymer flow-through multi-port tee.
 - 3. Engineered polymer commercial branch multi-port tee.
 - 4. Engineered polymer commercial branch multi-port elbow.
 - 5. Engineered polymer commercial flow-through multi-port tee.

- E. Manifolds: Multiple-outlet assembly complying with ASTM F 877 (CAN/CSA B137.5); with ASTM F 1960 outlets.
 - 1. Engineered polymer valved manifold.
 - 2. Engineered polymer valveless manifold.
 - 3. Lead - free copper branch manifold.
 - 4. Lead-free copper valved manifold.

2.04 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. PEX-to-Metal Transition Fittings:
 - 1. Manufacturers: Provide fittings from the same manufacturer of the piping.
 - 2. PEX-a to Threaded Brass Transition: One-piece brass fitting with male or female threaded adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
 - 3. PEX-a to Brass Sweat Transition: One-piece brass fitting with sweat adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
 - 4. PEX-a to Flange Transition: Two-piece fitting with one steel flange conforming to ASME B 16.5 and one lead free (LF) brass adapter conforming to ASTM F 1960.
 - 5. PEX-a to Groove Transition: One-piece lead free (LF) brass fitting with one CSA B242-05 groove end in either iron pipe size (IPS) or copper tube size (CTS) and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
 - 6. PEX-a to Water Meter Transition: Two-piece fitting with one NPSM union thread and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
 - 7. PEX-a to Copper Press Transition: One-piece lead free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

2.05 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. A.Y. McDonald Mfg. Co.
 - b. Capitol Manufacturing Company.
 - c. Central Plastics Company.
 - d. HART Industrial Unions, LLC.
 - e. Jomar Valve.
 - f. Matco-Norca.
 - g. Watts; a Watts Water Technologies company.
 - h. Wilkins.
 - i. Zurn Industries, LLC.
2. Standard: ASSE 1079.
 3. Pressure Rating: 125 psig minimum at 180 deg F.
 4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Matco-Norca.
 - d. Watts; a Watts Water Technologies company.
 - e. Wilkins.
 - f. Zurn Industries, LLC.
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 125 psig minimum at 180 deg F.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

PART 3 EXECUTION

3.01 PREPARATION FOUNDATION FOR BELOW GRADE WATER DISTRIBUTION PIPE AND FITTINGS

- A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated invert elevation.
- C. Pipe Beds:
 - 1. Copper Tube: Provide 6" thick sand pipe bed underneath and around sides of pipe, up to middle half of the pipe, including fittings. Tamp bed with mechanical tamper to 85% to 95% compaction. Provide first layer of sand backfill 6" above pipe, tamp backfill with mechanical tamper to 85% to 95% compaction.
 - 2. Ductile Iron Pipe: Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation. Provide first layer of pea gravel backfill 6" above pipe, tamp backfill with mechanical tamper to 85% to 95% compaction. For piping with rock trench bottoms, provide sand pipe bed 6" underneath and around sides of pipe up to middle half of the pipe, including fittings.
- D. Provide backfill above top of pipe bed as required for field conditions. Refer to Division 22 Section "General Plumbing Requirements" for materials and methods for backfill.

3.02 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install domestic water piping level and plumb.
- F. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

- G. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- I. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- K. Install piping to permit valve servicing.
- L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and branch connections.
- O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- P. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump.
- Q. Install thermostats in hot-water circulation piping.
- R. Install thermometers on inlet and outlet piping from each water heater.
- S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.03 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.04 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.05 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings: Use dielectric couplings, nipples, or unions.

3.06 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

3.07 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.08 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.09 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

- 1. Refer to the inspection report form at the end of this section for inspection data to be completed for each piping system. Submit completed forms to the Owner and Engineer.

3.010 ADJUSTING

A. Perform the following adjustments before operation:

- 1. Close drain valves, hydrants, and hose bibbs.
- 2. Open shutoff valves to fully open position.
- 3. Open throttling valves to proper setting.
- 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
- 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.

6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.011 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush the system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
 - f. To prevent reduced service life of system components, do not allow disinfection solutions to remain in the system longer than 24 hours. Flush the system with potable water after disinfection.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.012 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

- D. Under-slab, domestic water, building-service piping, NPS 2-1/2 and smaller, shall be the following:
 - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- E. Aboveground domestic water piping, NPS 2-1/2 and smaller, shall be the following:
 - 1. PEX-a piping, with engineered polymer (EP) or lead-free brass F1960 cold-expansion fittings.

END OF SECTION

PLUMBING & PLUMBING PIPING SYSTEMS
INSPECTION REPORT FORM

Project Name: _____

Project No : _____

General Contractor: _____

Contractor Project No: _____

Inspection Date: _____

Temperature: _____

System Inspected

Building: _____

Location/Description: _____

Service: _____

Inspection Results

Remarks:

Contractor Supervisor's signature:

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water-hammer arresters.
11. Trap-seal primer valves.
12. Access panels
13. Flexible Connectors

1.02 SUBMITTALS

- A. Product Data: For each type of product.
- B. Field quality-control reports.

1.03 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.04 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish one valve key for each key-operated wall hydrant, hose bibb, fixture supply or faucet installed.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61.

2.02 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.
- B. See Plumbing Fixture Schedule on drawings for additional requirements on individual items.

2.03 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Standard: ASSE 1001.
 - 2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 3. Body: Bronze.
 - 4. Inlet and Outlet Connections: Threaded.
 - 5. Finish: Rough bronze.
- B. Hose-Connection Vacuum Breakers:
 - 1. Standard: ASSE 1011.
 - 2. Body: Bronze, nonremovable, with manual drain.
 - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 4. Finish: Chrome or nickel plated.

2.04 BACKFLOW PREVENTERS

- A. Intermediate Atmospheric-Vent Backflow Preventers:
 - 1. Standard: ASSE 1012.
 - 2. Operation: Continuous-pressure applications.
 - 3. Size: As indicated on drawings.
 - 4. Body: Bronze.
 - 5. End Connections: Union, solder joint.
 - 6. Finish: Chrome plated.
- B. Reduced-Pressure-Principle Backflow Preventers:
 - 1. Standard: ASSE 1013.
 - 2. Operation: Continuous-pressure applications.
 - 3. Pressure Loss: 12 psig maximum, through middle third of flow range.
 - 4. Size: As shown on drawings.
 - 5. Pressure Loss at Design Flow Rate: 8 psig for NPS 2-1/2 and larger.
 - 6. Body: 304 stainless steel for NPS 2-1/2 and larger.
 - 7. End Connections: Flanged for NPS 2-1/2 and larger.
 - 8. Configuration: Designed for vertical-inlet, horizontal-center-section, and vertical-outlet flow.
 - 9. Accessories:

- a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
- b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
- c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Double-Check, Backflow-Prevention Assemblies:

- 1. Standard: ASSE 1015.
- 2. Operation: Continuous-pressure applications unless otherwise indicated.
- 3. Pressure Loss: 5 psig maximum, through middle third of flow range.
- 4. Size: As shown on drawings.
- 5. Body: Bronze for NPS 2 and smaller; stainless steel for NPS 2-1/2 and larger.
- 6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
- 7. Configuration: Designed for horizontal, straight-through flow.
- 8. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

2.05 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

- 1. Standard: ASSE 1003.
- 2. Pressure Rating: Initial working pressure of 150 psig.
- 3. Size: As shown on drawings.
- 4. Design Inlet/Outlet Pressure: As indicated on drawings.
- 5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
- 6. Valves for Booster Heater Water Supply: Include integral bypass.
- 7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.06 BALANCING VALVES

A. Memory-Stop Balancing Valves:

- 1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
- 2. Pressure Rating: 400-psig minimum CWP.
- 3. Size: NPS 2 or smaller.
- 4. Body: Copper alloy.
- 5. Port: Standard or full port.
- 6. Ball: Chrome-plated brass.
- 7. Seats and Seals: Replaceable.
- 8. End Connections: Solder joint or threaded.
- 9. Handle: Vinyl-covered steel with memory-setting device.

2.07 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Standard: ASSE 1017.
2. Pressure Rating: 125 psig.
3. Type: Thermostatically controlled, water mixing valve.
4. Material: Bronze body with corrosion-resistant interior components.
5. Connections: Threaded union inlets and outlet.
6. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
7. Tempered-Water Setting: 120 deg F.
8. Valve Finish: Rough bronze.

B. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong International, Inc.
 - b. Lawler Manufacturing Company, Inc.
 - c. Leonard Valve Company.
 - d. Powers; a division of Watts Water Technologies, Inc.
 - e. Symmons Industries, Inc.
 - f. Zurn Industries, LLC
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 120 deg F.
9. Tempered-Water Design Flow Rate: As indicated on drawings.
10. Pressure Drop at Design Flow Rate: As indicated on drawings.
11. Valve Finish: Rough bronze.
12. Piping Finish: Copper.

2.08 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.

5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.033 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.

6. Drain: Pipe plug.

2.09 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish: Chrome plated brass.
9. Operation: Operating key.
10. Include operating key with each operating-key hose bibb.
11. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.010 WALL HYDRANTS

A. Non-freeze Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Chrome plated.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): One with each wall hydrant.

B. Vacuum Breaker Wall Hydrants:

1. Standard: ASSE 1019, Type B.
2. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
3. Classification: Type B, for automatic draining with hose removed or with hose attached and nozzle closed.

4. Pressure Rating: 125 psig.
5. Operation: Loose key.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 1/2 or NPS 3/4.
8. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.011 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.012 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. Precision Plumbing Products, Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - g. Tyler Pipe; Wade Div.
 - h. Watts Drainage Products.
 - i. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.013 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/4 minimum.
4. Material: Chrome-plated, cast brass.

2.014 ACCESS PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arrow United Industries.
 2. Bar-Co., Inc.
 3. J.L Industries.
 4. Karp Associates, Inc.
 5. Milcor Div. Inryco, Inc.
 6. Nystrom Building Products
 7. Wade
 8. Zurn
- B. Provide access doors for all concealed equipment, except where above lay-in ceilings. Refer to Section "Plumbing Identification" for labeling of access doors.
- C. Access doors shall be adequately sized for the devices served with a minimum size of 18" x 18", furnished by the respective Trade and installed by the Contractor.

- D. Access doors must be of the proper construction for type of construction where installed.
- E. The exact location of all access doors shall be verified with the Architect prior to installation.
- F. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel with welds ground smooth and flush with adjacent surfaces.
- G. Frames: 16-gauge steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile or wood paneling.
- H. For installation in masonry, concrete, ceramic tile, or wood paneling: 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors.
- I. For gypsum wallboard or plaster: perforated flanges with wallboard bead.
- J. For full-bed plaster applications: galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
- K. Flush Panel Doors: 14-gauge sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.
- L. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.
- M. Locking Devices: Flush, screwdriver-operated cam locks.
- N. Locking Devices: Where indicated on the drawings or where access panels are installed in locations accessible to the public, provide 5-pin or 5-disc type cylinder locks, individually keyed; provide 2 keys.

2.015 FLEXIBLE CONNECTORS

A. Metal Flexible Connectors:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. U.S. Hose, Corp.
 - b. Hyspan
 - c. Mason Industries, Inc
 - d. Mercer Rubber Co.
 - e. Metraflex Co.
 - f. Proco Products, Inc.
 - g. Resistoflex
 - h. Tyler Pipe; Gustin-Bacon Div.

B. Rubber Flexible Connectors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. General Rubber Corp.
 - b. Mason Industries, Inc
 - c. Mercer Rubber Co.
 - d. Metraflex Co.
 - e. Proco Products, Inc.
 - f. Uniflex, Inc.
- C. Fabricated from materials suitable for system fluid and that will provide flexible pipe connections.
 1. Bronze-Hose, Flexible Connectors (Domestic Water Systems): Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.
 2. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing with bronze wire braid. Include stainless-steel nipples or flanges, welded to hose.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- E. Install Y-pattern strainers for water on supply side of each control valve water pressure-reducing valve solenoid valve and pump.

- F. Install water-hammer arresters in water piping according to PDI-WH 201.
- G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- H. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.
- I. Set frames for access doors accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces. Adjust hardware and panels after installation for proper operation.
- J. Install flexible connectors for piping system connections on equipment side of shutoff valves for all Plumbing equipment, pumps, and where indicated on Drawings.
- K. Install flexible connectors according to manufacturer's recommendations.

3.02 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.03 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.04 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.

1.02 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.03 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.02 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, class.
- B. Gaskets: ASTM C 564, rubber.

2.03 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 1. Standards: ASTM C 1277 and CISPI 310.
 - 2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Standards: ASTM C 1277 and ASTM C 1540.
2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.04 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.05 PVC PIPE AND FITTINGS

- A. Solid-Wall Schedule 40 PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. Solid-Wall Schedule 80 PVC Pipe: ASTM D 1784, drain, waste, and vent.
- C. Schedule 40 PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns.
- D. Schedule 80 PVC Socket Fittings: ASTM D 2467
- E. Adhesive Primer: ASTM F 656.
- F. Solvent Cement: ASTM D 2564.

2.06 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 3. Unshielded, Non-pressure Transition Couplings:
 - a. Standard: ASTM C 1173.

- b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- 4. Shielded, Non-pressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 EXECUTION

3.01 EARTH MOVING

- A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated invert elevation.
- C. Pipe Beds:
 - 1. PVC, PE and ABS Pipe: Provide 6" thick sand pipe bed underneath and around sides of pipe, up to middle half of the pipe, including fittings. Tamp bed with mechanical tamper to 85% to 95% compaction. Provide first layer of sand backfill 6" above pipe, tamp backfill with mechanical tamper to 85% to 95% compaction. Refer to ASTM D2321 "Underground Installation of Thermoplastic Pipe for Sewers and Gravity-flow Applications" for additional requirements.
 - 2. Cast Iron Soil Pipe: Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation. For piping with rock trench bottoms, provide sand pipe bed 6" underneath and around sides of pipe, including fittings.
- D. Provide backfill above top of pipe bed as required for field conditions. Refer to Division 22 Section "General Plumbing Requirements" for materials and methods for backfill.

3.02 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back-to-back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 1/4 per ft (2 percent) downward in direction of flow for piping NPS 3 and smaller; 1/8 inch per ft (1 percent) downward in direction of flow for piping NPS 4 and larger.
 - 2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- L. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

- M. Install aboveground PVC piping according to ASTM D 2665 and ASTM D 1784.
- N. Install underground PVC piping according to ASTM D 2321.
- O. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

3.03 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- E. Plastic, Non-pressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Piping: Join according to ASTM D 2855, ASTM D 2665, and ASTM D 1784 Appendixes.

3.04 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Unshielded or Shielded, non-pressure transition couplings.

3.05 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 6. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 2. NPS 3: 60 inches with 1/2-inch rod.
 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
 5. NPS 6: 10 feet with 5/8-inch rod.
 6. NPS 8: 10 feet with 3/4-inch rod.
- H. Install supports for vertical copper tubing every 10 feet.
- I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 2. NPS 3: 48 inches with 1/2-inch rod.
 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
- J. Install supports for vertical PVC piping every 48 inches.
- K. Support condensate piping located on roof with pre-engineered roof supports, pre-engineered roof supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping". Conform to the table above for maximum spacing of supports. Adjust pipe support to maintain minimum pipe slope.
- L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.06 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
 6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.07 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.08 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

1. Refer to the inspection report form at the end of this section for inspection data to be completed for each piping system. Submit completed forms to the Owner and Engineer.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building.

Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.09 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing exposed to sunlight with two coats of water-based latex paint.

3.010 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil/waste and vent piping shall be any of the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Solid-wall Schedule 40 PVC pipe, PVC socket fittings, and solvent-cemented joints.
 5. Dissimilar Pipe-Material Couplings: Unshielded, non-pressure transition couplings.
- C. Underground, soil, waste, and vent shall be any of the following:
 1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints. Heavy duty to be used on NPS 5 and larger
 3. Solid wall Schedule 40 PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, non-pressure transition couplings.
- D. Inside condensate piping:
 1. Solid wall Schedule 40 PVC pipe, PVC socket fittings, and solvent-cemented joints.

E. Outside condensate piping:

1. Solid wall Schedule 80 PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION

PLUMBING & PLUMBING PIPING SYSTEMS
INSPECTION REPORT FORM

Project Name: _____

Project No : _____

General Contractor: _____

Contractor Project No: _____

Inspection Date: _____

Temperature: _____

System Inspected

Building: _____

Location/Description: _____

Service: _____

Inspection Results

Remarks:

Contractor Supervisor's signature:

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Cleanouts.
 - 2. Floor drains / Floor sinks.

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.03 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 PRODUCTS

2.01 CLEANOUTS

- A. Cast-Iron Floor & Wall Cleanouts: As specified in drawings.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. Smith, Jay R. Mfg. Co.
 - c. Tyler Pipe; a subsidiary of McWane Inc.
 - d. Watts; a Watts Water Technologies company.
 - e. Zurn Industries, LLC.
 - 2. Standard: ASME A112.36.2M

2.02 FLOOR DRAINS AND FLOOR SINKS

- A. Cast-Iron Floor Drains and Floor Sinks: As specified in drawings.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. Smith, Jay R. Mfg. Co.

- c. Tyler Pipe; a subsidiary of McWane Inc.
 - d. Watts; a Watts Water Technologies company.
 - e. Zurn Industries, LLC.
2. Standard: ASME A112.6.3.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. Exterior Cleanouts: Install exterior cleanouts embedded in a 18" x 18" x 8" block of concrete, flush with finished grade.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- H. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

- J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- L. Install vent caps on each vent pipe passing through roof.
- M. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.02 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.03 PROTECTION

- A. Protect drains during the remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

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SECTION 221413 - STORM DRAINAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

1.2 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

PART 2 PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Heavy-Duty, Hubless-Piping Couplings:

1. Standards: ASTM C 1277 and ASTM C 1540.
2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

- D. Solvent Cement: ASTM D 2564.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Shielded, Non-pressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping at indicated slopes.
- D. Install piping free of sags and bends.
- E. Install fittings for changes in direction and branch connections.
- F. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- G. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- H. Install storm drainage piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 1/8" per ft (2 percent) downward in direction of flow for piping NPS 3 and smaller; 1/8" per ft (1 percent) downward in direction of flow for piping NPS 4 and larger.
 - I. Floor Cleanouts: Install in below floor building drain piping at minimum intervals of 50' for piping NPS 4 and smaller and 100' for larger piping.
 - J. Exterior Cleanouts: Install exterior cleanouts embedded in a 18" x 18" x 8" block of concrete, flush with finished grade.
 - K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
 - L. Install aboveground PVC piping according to ASTM D 2665.
 - M. Install underground PVC piping according to ASTM D 2321.
 - N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
 - O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
 - P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- ### 3.2 JOINT CONSTRUCTION
- A. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 - B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
 - C. Plastic, Non-pressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.
- ### 3.3 SPECIALTY PIPE FITTING INSTALLATION
- A. Transition Couplings:
 1. Install transition couplings at joints of piping with small differences in OD's.

2. In Drainage Piping: Shielded, non-pressure transition couplings.

3.4 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping and storm drainage specialties as specified in drawings.

3.5 IDENTIFICATION

- A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.6 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections, and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 1. Refer to the inspection report form at the end of this section for inspection data to be completed for each piping system. Submit completed forms to the Owner and Engineer.
- D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.7 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.8 PIPING SCHEDULE

- A. Underground storm drainage piping shall be any of the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; heavy-duty, hubless-piping couplings; and coupled joints.
 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, non-pressure transition couplings.

END OF SECTION

PLUMBING & PLUMBING PIPING SYSTEMS
INSPECTION REPORT FORM

Project Name: _____

Project No : _____

General Contractor: _____

Contractor Project No: _____

Inspection Date: _____

Temperature: _____

System Inspected

Building: _____

Location/Description: _____

Service: _____

Inspection Results

Approved to Insulate: Y N

Approved to Backfill: Y N

Approved to Cover in Wall: Y N

Remarks:

Contractor Supervisor's signature: _____

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Commercial, electric, storage, domestic-water heaters.
2. Domestic-water heater accessories.

1.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.03 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated.

1.04 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For commercial domestic-water heaters, accessories, and components, from manufacturer.
- B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Warranty: Sample of special warranty.

1.05 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.06 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex, "Drinking Water System Components - Health Effects."

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Three years.
 - 2) Controls and Other Components: Three years.

PART 2 PRODUCTS

2.01 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

- A. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Bradford White.
 - b. Smith, A. O. Corporation.
 - c. Rheem
 - d. State Industries
 - 2. Standard: UL 1453.
 - 3. Storage-Tank Construction: Steel vertical arrangement.
 - a. Tappings: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig (1035 kPa).
 - c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
 - 4. Factory-Installed Storage-Tank Appurtenances:

- a. Anode Rod: Replaceable magnesium.
 - b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
 - c. Insulation: Comply with ASHRAE/IESNA 90.1.
 - d. Jacket: Steel with enameled finish.
 - e. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation unless otherwise indicated. Limited to 12 kW total.
 - f. Temperature Control: Adjustable thermostat.
 - g. Safety Controls: High-temperature-limit device or systems.
 - h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
- 5. Special Requirements: NSF 5 construction.
 - 6. Capacity and Characteristics: as indicated on schedule on drawings

2.02 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. AMTROL, Inc.
 - b. Flexcon Industries.
 - c. Honeywell Water Controls.
 - d. Pentair Pump Group.
 - e. Smith, A. O. Corporation.
 - f. State Industries.
 - g. Taco, Inc.
- 2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
- 3. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 Annex barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
- 4. Capacity and Characteristics: As specified in drawings.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater and include drain outlet

not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 and as required by local jurisdiction.
- D. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig-maximum outlet pressure unless otherwise indicated.
- E. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- F. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- G. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.03 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

PART 3 EXECUTION

3.01 DOMESTIC-WATER HEATER INSTALLATION

- A. Electric, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters on wall bracket as specified in the drawings.
 - 1. Maintain manufacturer's recommended clearances.
 - 2. Arrange units so controls and devices that require servicing are accessible.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Anchor domestic-water heaters to substrate.

- B. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General Duty Ball Valves for Plumbing Piping".
- C. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install combination temperature-and-pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- G. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- H. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.
- I. Fill electric, domestic-water heaters with water.
- J. Charge domestic-water compression tanks with air.

3.02 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.03 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.04 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Prepare test and inspection reports.

END OF SECTION

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SECTION 224000 - PLUMBING FIXTURES (REQUIRED VENDOR)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Water closets.
2. Urinals
3. Lavatories.
4. Sinks.
5. Service sinks.
6. Water coolers.
7. Emergency equipment
8. Toilet seats.
9. Flush valves
10. Faucets.
11. Supply fittings.
12. Waste fittings.
13. Supports and carriers
14. Insulation kits

1.02 DEFINITIONS

- A. Accessible: Describes a plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped people.
- B. Accessory: Device that adds effectiveness, convenience, or improved appearance to a fixture but is not essential to its operation.
- C. Appliance: Device or machine designed and intended to perform a specific function.
- D. Appurtenance: Device or assembly designed to perform some useful function when attached to or used with a fixture.
- E. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.
- F. Fitting: Fitting installed on or attached to a fixture to control the flow of water into or out of the fixture.
- G. Fixture: Installed receptor connected to the water distribution system, that receives and makes available potable water and discharges the used liquid or liquid-borne wastes directly or indirectly into the drainage system. The term "Fixture" means the actual receptor, except when used in a general application where terms "Fixture" and "Plumbing

Fixture" include associated trim, fittings, accessories, appliances, appurtenances, support, and equipment.

- H. Roughing-In: Installation of piping and support for the fixture prior to the actual installation of the fixture.
- I. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required. Categories of supports are:
 - 1. Carrier: Floor-mounted support for wall-mounted water closet, and support fixed to wall construction for wall-hung fixture.
 - 2. Chair Carrier: Support for wall-hung fixture, having steel pipe uprights that transfer weight to the floor.
 - 3. Chair Carrier, Heavy Duty: Support for wall-hung fixture, having rectangular steel uprights that transfer weight to the floor.
 - 4. Reinforcement: Steel plate built into wall construction, for securing fixture to wall.
- J. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.03 SUBMITTALS

- A. Product Data: For each type of product.
- B. Maintenance data.

1.04 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish spare parts described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.
 - 1. Faucet Washers and O-rings: Furnish quantity of identical units not less than 10 percent of amount of each installed.
 - 2. Faucet Cartridges and O-rings: Furnish quantity of identical units not less than 5 percent of amount of each installed.
 - 3. Flushometer Repair Kits: Furnish quantity of identical units not less than 10 percent of amount of each flushometer installed.
 - 4. Provide individual metal boxes or a hinged-top wood or metal box having separate compartments for each type and size of above extra materials.
 - 5. Toilet Seats: Furnish quantity of identical units not less than 3 percent of amount of each type toilet seat installed.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of ANSI Standard A117.1, "Buildings and Facilities --Providing Accessibility and Useability for Physically Handicapped People," Public Law 90480, "Architectural Barriers Act, 1968," with respect to plumbing fixtures for the physically handicapped and "Americans with Disabilities Act Accessibility Guidelines for Buildings 1991" with respect to plumbing fixtures for the physically handicapped.
- B. Regulatory Requirements: Comply with requirements of ATBCB (Architectural and Transportation Barriers Compliance Board) "Uniform Federal Accessibility Standards (UFAS) -1985-494-187" with respect to plumbing fixtures for the physically handicapped.
- C. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
 - 1. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Faucets and trim in contact with drinking water shall meet or exceed the Safe Water Drinking Act (SWDA) lead free standards of ANSI/NSF Standard 61, section 9.
- E. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixtures having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of plumbing fixtures is on the proposer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed for that category:
 - 1. Water Closets:
 - a. American Standard, Inc.
 - b. Gerber
 - c. Kohler Co.
 - d. Sloan
 - e. Toto Ltd.

2. Urinals:
 - a. American Standard, Inc.
 - b. Gerber
 - c. Kohler Co.
 - d. Sloan
 - e. Toto Ltd.
3. Lavatories:
 - a. American Standard, Inc.
 - b. Kohler Co.
 - c. Toto Ltd.
 - d. Zurn Industries, LLC
4. Sinks:
 - a. American Standard, Inc.
 - b. Elkay Manufacturing Co.
 - c. Kohler Co.
5. Service Sinks:
 - a. Fiat Products.
 - b. Stern-Williams
 - c. Zurn Industries, LLC
6. Water Coolers:
 - a. Elkay Manufacturing Co.
 - b. Halsey Taylor
 - c. Murdock
7. Emergency Equipment:
 - a. Bradley Corp.

- b. Guardian
 - c. Haws
- 8. Toilet Seats
 - a. American Standard, Inc.
 - b. Bemis Mfg. Co.
 - c. Church
 - d. Gerber
 - e. Kohler Co.
 - f. Toto Ltd.
- 9. Flushometers:
 - a. American Standard, Inc.
 - b. Sloan
 - c. Zurn
- 10. Commercial/Industrial Cast-Brass Faucets:
 - a. American Standard, Inc.
 - b. Chicago Faucet Co.
 - c. Delta
 - d. Moen
 - e. Sloan
- 11. Sensor-Operated Faucets and Devices
 - a. American Standard, Inc.
 - b. Bradley corp.
 - c. Chicago
 - d. Delta
 - e. Moen

- f. Sloan
- 12. Stop valves & Supplies:
 - a. Brasscraft
 - b. McGuire Manufacturing Co., Inc.
 - c. Zurn Industries, Inc.
- 13. P-traps, Drains & Miscellaneous Fittings:
 - a. Brasscraft
 - b. McGuire Manufacturing Co, Inc.
 - c. Sloan
 - d. Zurn Industries, Inc.
- 14. Supports and carriers:
 - a. Josam
 - b. Watts
 - c. Zurn Industries, Inc.; Hydromechanics Div.
- 15. Insulation Kits:
 - a. Brocar
 - b. McGuire
 - c. Plumberex
 - d. PROFLO
 - e. Trap-Wrap
 - f. Truebro, Inc.

2.02 FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Sink Faucets: General: As described on the drawings.

2.03 STOP VALVES & SUPPLIES

- A. Supplies General: As described on the drawings.

1. Exposed piping and parts shall be polished chrome plated.

2.04 P-TRAPS, DRAINS AND MISCELLANEOUS FITTINGS

- A. Fittings General: As described on the drawings, except as listed below:

1. Exposed piping and fittings shall be polished chrome plated.

- B. Fittings installed concealed inside a plumbing fixture or within wall construction may be without chrome plate finish.
- C. Sink Continuous Wastes: Polished chrome-plated, tubular brass, 1-1/2 inches, 17 gauge, with brass nuts on slip inlets, and of configurations indicated.
- D. Escutcheons: Wall flange with set screw.
- E. Escutcheons: Polished chrome-plated, sheet steel wall flange with friction clips.
- F. Deep Pattern Escutcheons: Wall flange with set screw or sheet steel wall flange with friction clips, of depth adequate to conceal protruding roughing-in fittings.

2.05 FLUSHOMETERS

- A. Provide flushometers compatible with fixtures, with features and of consumption indicated as described on drawings.

1. Exposed metal parts shall be polished chrome plated.
2. Flush valves installed with wall construction may be without chrome plate finish.

2.06 TOILET SEATS

- A. General: as described on the drawings.

2.07 PLUMBING FIXTURE SUPPORTS AND CARRIERS

- A. Supports: ASME A112.6.1M, categories and types as required for wall-hanging fixtures specified, and wall reinforcement.

- B. Support categories are:

1. Carriers: Supports for wall-hanging water closets and fixtures supported from wall construction. Water closet carriers shall have an additional faceplate and coupling when used for wide pipe spaces. Provide tiling frames or setting gauge with carriers for wall-hanging water closets.
2. Chair Carriers: Supports with steel pipe uprights for wall-hanging fixtures. Urinal chair carriers shall have bearing plates.
3. Chair Carriers, Heavy Duty: Supports with rectangular steel uprights for wall-hanging fixtures.
4. Reinforcement: 1/4-inch by 6-inch steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.

- C. Support Types: Provide support of category specified, of type having features required to match fixture.
- D. Provide supports specified as part of fixture description, in lieu of category and type requirements.

2.08 INSULATION KITS

- A. Insulation kits for lavatory and sink waste and supplies of vinyl plastic with reusable fasteners and openings for access to supply stop handles.

PART 3 EXECUTION

3.01 APPLICATION

- A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.
- B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
 - 1. Carriers for the following fixtures:
 - a. Wall-hanging water closets.
 - b. Wall-hanging electric water coolers and drinking fountains.
 - c. Wall-hanging fixtures supported from wall construction.
 - 2. Chair carriers for the following fixtures:
 - a. Wall-hanging urinals.
 - b. Wall-hanging drinking fountains and electric water coolers.
 - 3. Heavy-duty chair carriers for the following fixtures:
 - a. Accessible lavatories.
 - b. Fixtures where specified.

3.02 INSTALLATION

- A. Install plumbing fixtures level and plumb according to manufacturer's written installation instructions, roughing-in drawings and referenced standards.
- B. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gauge.
- C. Install wall-hanging, back-outlet urinals with gasket seals.

- D. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.
- E. Fasten floor-mounted fixtures and special fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.
- F. Fasten wall-mounted fittings to reinforcement built into walls.
- G. Install counter-mounting fixtures in and attached to casework.
- H. Secure supplies behind wall or within wall pipe space, providing rigid installation.
- I. Install toilet seats on water closets.
- J. Set mop basins in leveling bed of cement grout.
- K. Install stop valve in an accessible location in each water supply to each fixture.
- L. Install trap on fixture outlet except for fixtures having integral trap.
- M. Install wall flanges or escutcheons at piping wall, floor and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.
- N. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- O. Install insulation kits on ADA compliant sink and lavatory waste, continuous wastes, hot and cold water supplies where indicated on the drawings and as required by the ADA.

3.03 CONNECTIONS

- A. Piping installation requirements are specified in other sections of Division 22. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 22.
 - 2. Install piping connections indicated between appliances and equipment specified in other sections, direct connected to plumbing piping systems.

3.04 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.05 ADJUSTING AND CLEANING

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- C. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.
- D. Adjust water pressure at electric water coolers, faucets, and flushometers having controls, to provide proper flow and stream.
- E. Adjust water-cooler temperature settings.
- F. Install ball or gate valves on water connections to remote water coolers.
- G. Replace washers of leaking and dripping faucets and stops.
- H. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.
- I. Review the data in Operating and Maintenance Manuals. Refer to Division 1 Section "Project Closeout."
- J. Provide protective covering for installed plumbing fixtures and fittings.
- K. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

3.06 FIXTURE SCHEDULE

- A. Provide plumbing fixtures as specified on the drawings.
- B. Install rough-in for plumbing fixtures as scheduled on the drawings.

3.07 MOUNTING HEIGHTS SCHEDULE

- A. Refer to architectural drawings for plumbing fixture mounting heights unless indicated otherwise.

END OF SECTION

SECTION 229100 - TESTING REQUIREMENTS AND COMPLETION FORM

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORMED AND PASSED
220010.3.6.A.4	Substantial completion review. Prior to requesting inspection for "CERTIFICATE OF SUBSTANTIAL COMPLETION", the Contractor shall perform start-up testing of system	Plumbing Contractor	
224000.3.1.A	Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.	Plumbing Contractor	
220523.3.6.A	Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists	Plumbing Contractor	
220548.3.4	A. Testing Agency: Engage a qualified testing agency to perform tests and inspections. B. Perform tests and inspections. C. Tests and Inspections: 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction. 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice. 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members. 4. Test to 90 percent of rated proof load of device. 5. Measure isolator restraint clearance. 6. Measure isolator deflection. 7. Verify snubber minimum clearances. D. Remove and replace malfunctioning units and retest as specified above. E. Prepare test and inspection reports. Contractor's Report: The vibration isolation vendor shall inspect and approve the installation of the vibration isolators and shall submit a report to the Owner which verifies that all of the isolation equipment has been properly installed and that the installation is in full conformance with the specification. The report shall record the vibration isolator identification and model or type. For isolators containing steel springs the report shall also record the size and uncompressed height, design static deflection and measured static deflection of the isolators provided	Vibration Isolation Vendor	
221111.3.2.A	Water distribution piping installations shall be installed subject to Division 22 Section "Water Distribution Systems and Specialties" in addition to those requirements specified in this Section.	Plumbing Contractor	
221111.3.7.B	Installing contractor shall visually inspect couplings and repair or replace any misaligned couplings and couplings with gaps prior to calling for inspection as defined in Division 22 Section "General Plumbing Requirements."	Plumbing Contractor	

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORMED AND PASSED
221113.3.5.A	Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water	Plumbing Contractor	
221113.3.5.B	Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.	Plumbing Contractor	
221113.3.5.C	Prepare reports of testing activities. See attached form at the end of the section.	Plumbing Contractor	
221113.3.7.A	Clean and disinfect water-distribution piping as follows: 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use. 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet. 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows: a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours. b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours. c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system. d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.	Plumbing Contractor	
221113.3.7.B	Prepare reports of purging and disinfecting activities.	Plumbing Contractor	

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORMED AND PASSED
221116.3.9.A.2	Piping Tests: a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water. b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested. c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested. d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired. e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained. f. Prepare reports for tests and for corrective action required.	Plumbing Contractor	
221116.3.9.B	Domestic water piping will be considered defective if it does not pass tests and inspections.	Plumbing Contractor	
221116.3.9.C	Prepare test and inspection reports. See attached form at the end of the section.	Plumbing Contractor	
221116.3.11.A.1	Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.	Plumbing Contractor	
221116.3.11.A.2	Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described in the section.	Plumbing Contractor	
221116.3.11.B	Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.	Plumbing Contractor	
221119.3.3.A.1	Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.	Plumbing Contractor	
221119.3.3.B	Domestic water piping specialties will be considered defective if they do not pass tests and inspections.	Plumbing Contractor	
221119.3.3.C	Prepare test and inspection reports.	Plumbing Contractor	
221316.3.8.A	During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.	Plumbing Contractor	
221316.3.8.B	Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.	Plumbing Contractor	

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORMED AND PASSED
221316.3.8.C	Reports: Prepare inspection reports and have them signed by authorities having jurisdiction. See attached form at end of the section.	Plumbing Contractor	
221316.3.8.D	Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows: 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested. 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested. 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks. 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks. 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained. 6. Prepare reports for tests and required corrective action.	Plumbing Contractor	
221413.3.6.A	During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.	Plumbing Contractor	
221413.3.6.B	Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.	Plumbing Contractor	
221413.3.6.C	Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.		

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORMED AND PASSED
221413.3.6.D	Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows: 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested. 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested. 3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks. 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained. 5. Prepare reports for tests and required corrective action.	Plumbing Contractor	
221429.3.4.A	Tests and Inspections: 1. Perform each visual and mechanical inspection. 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist. 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.	Plumbing Contractor	
221429.3.4.B	Pumps and controls will be considered defective if they do not pass tests and inspections.	Plumbing Contractor	
221429.3.4.C	Prepare test and inspection reports.	Plumbing Contractor	
223300.3.4.A	Perform tests and inspections. 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist. 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation. 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.	Plumbing Contractor	
223300.3.4.B	Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Prepare test and inspection reports	Plumbing Contractor	
224000.3.4.A	Inspect each installed fixture for damage. Replace damaged fixtures and components.	Plumbing Contractor	
224000.3.4.B	Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.	Plumbing Contractor	

END OF SECTION

SECTION 229200 - O & M REQUIREMENTS AND COMPLETION FORM

REFER TO SECTION #	O & M REQUIRED INFORMATION	DATE O & M MANUALS DELIVERED/TASK COMPLETED
220010.1.10.A	Submit manuals prior to requesting the final punch list	
220010.1.10.B	Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division	
220010.1.10.C	At the completion of the project furnish to the Architect for the Owner, four (4) copies of brochures in three-ring, loose-leaf, hard-back notebook form, divided and tabbed, containing equipment data, approved shop drawings, diagrams, capacities, spare part numbers, manufacturer's service and maintenance data, warranties, guarantees, etc. Include local contacts complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications	
221119.1.4.A	Submit closeout operation and maintenance data for domestic water piping specialties.	
221113.1.6.A	Submit closeout operation and maintenance data for facility water distribution piping.	
221429.1.3.A	Submit closeout operation and maintenance data for sump pump.	
223300.1.5.A	Submit closeout operation and maintenance data for electric, domestic water heater.	
224000.1.3.B	Submit maintenance data for plumbing fixtures.	

END OF SECTION

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SECTION 230010 – GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Refer to Section 00 2200 Supplementary Instructions to Bidders, Items Furnished by Owner and comply with all requirements including use of Forms A – E.
- B. This Division requires the furnishing and installing of complete functioning systems, and each element thereof, as specified or indicated on the Drawings and Specifications or reasonably inferred; including every article, device or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- C. Division 23 of the Specifications and Drawings numbered with prefixes M, MP or ME, or MEP generally describe these systems, but the scope of the Mechanical work includes all such work indicated in the Contract Documents: Instructions to Bidders; Proposal Form; General Conditions; Supplementary General Conditions; Architectural, Structural, Mechanical, Plumbing and Electrical Drawings and Specifications; and Addenda.
- D. The Drawings have been prepared diagrammatically intended to convey the scope of work, indicating the intended general arrangement of the equipment, fixtures, ductwork, piping, etc. without showing all the exact details as to elevations, offsets, control lines, and other installation requirements. The Vendor and Contractor shall use the Drawings as a guide when laying out the work and shall verify that materials and equipment will fit into the designated spaces, and which, when installed per manufacturers requirements, will ensure a complete, coordinated, satisfactory and properly operating system.

1.2 QUALITY ASSURANCE

- A. All Work under this Division shall be executed in a thorough and professional manner by competent and experienced workmen licensed to perform the Work specified.
- B. All Work shall be installed in strict conformance with all manufacturers' requirements and recommendations, unless these Documents exceed those requirements. Install all equipment and materials in a neat and professional manner, aligned, leveled, and adjusted for satisfactory operation.
- C. All material and equipment shall be new, of the best quality and design, free from defects and imperfections and with markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size and capacity. Provide all material and equipment of the same type from the same manufacturer whenever practicable.

- D. Unless specified otherwise, manufactured items of the same types specified within this Division shall have been installed and used, without modification, renovation, or repair for not less than one year prior to date of bidding for this Project.

1.3 CODES, REFERENCES AND STANDARDS

- A. Execute all Work in accordance with, and comply at a minimum with, National Fire Protection Association (NFPA) codes, state and local building codes, and all other applicable codes and ordinances in force, governing the particular class of Work involved, for performance, workmanship, equipment, and materials. Additionally, comply with rules and regulations of public utilities and municipal departments affected by connection of services. Where conflicts between various codes, ordinances, rules, and regulations exist, comply with the most stringent. Wherever requirements of these Specifications, Drawings, or both, exceed those of the above items, the requirements of these Specifications, Drawings, or both, shall govern. Code compliance, at a minimum, is mandatory. Construe nothing in these Construction Documents as permitting work not in compliance, at a minimum, with these codes. Bring all conflicts observed between codes, ordinances, rules, regulations and these documents to the Architect's and Engineer's attention in sufficient time, prior to the opening of Bids, to prepare the Supplementary Drawings and Specifications Addenda required to resolve the conflict.
- B. If the conflict is not reported timely, prior to the opening of bids, resolve the conflict and provide the installation in accordance with the governing codes and to the satisfaction of the Architect and Engineer, without additional compensation. Contractor will be held responsible for any violation of the law.
- C. Obtain timely inspections by the constituted authorities having jurisdiction; and, upon final completion of the Work, obtain and deliver to the Owner executed final certificates of acceptance from these authorities having jurisdiction.
- D. All material, manufacturing methods, handling, dimensions, methods of installation and test procedures shall conform to industry standards, acts, and codes, including, but not limited to the following, except where these Drawings and Specifications exceed them:

BOCA	Building Officials Code Administration
IBC	International Building Code
IMC	International Mechanical Code
IPC	International Plumbing Code
IECC	International Energy Conservation Code
IFC	International Fire Code
IFGC	International Fuel Gas Code
ADA	Americans with Disabilities Act
ADC	Air Diffusion Council
AIA	Guidelines for Design and Construction of Hospital and Healthcare Facilities
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating Refrigerating and Air Conditioning Engineers

ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society of Testing Materials
AWS	American Welding Society
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
MSS	Manufacturer's Standardization Society of the Valve and Fitting Industry
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code, NFPA 70
NFPA	National Fire Protection Association
NEMA	National Electrical Manufacturer's Association
OSHA	Occupational Safety and Health Act
PDI	Plumbing and Drainage Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriter's Laboratories

- E. Comply with rules and regulations of public utilities and municipal departments affected by connections of services.
- F. All mechanical work shall be performed in compliance with applicable safety regulations, including OSHA regulations. All safety lights, guards, and warning signs required for the performance of the mechanical work shall be provided by the Contractor.

1.4 DEFINITIONS

- A. Whenever used in these Specifications or Drawings, the following terms shall have the indicated meanings:
 1. Furnish: "To supply and deliver to the project site, ready for unloading, unpacking, assembling, installing, and similar operations."
 2. Install: "To perform all operations at the project site, including, but not limited to, and as required: unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, testing, commissioning, starting up and similar operations, complete, and ready for the intended use."
 3. Provide: "To furnish and install complete, and ready for the intended use."
 4. Furnished by Owner (or Owner-Furnished) or Furnished by Others: "An item furnished by the Owner or under other Divisions or Contracts, and installed under the requirements of this Division by the job Contractor, complete, and ready for the intended use, including all items and services incidental to the Work necessary for proper installation and operation. Include the installation under the warranty required by this Division."
 5. Engineer: Where referenced in this Division, "Engineer" is the Engineer of Record and the Design Professional for the Work under this Division, and is a Consultant to, and an authorized representative of, the Architect, as defined in the General and/or Supplementary Conditions. When used in this Division, it means increased involvement by, and obligations to, the Engineer, in addition to involvement by, and obligations to, the "Architect".

6. AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the Work.
 7. NRTL: Nationally Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA, etc.), and acceptable to the Authority having Jurisdiction (AHJ) over this project. Nationally Recognized Testing Laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ, and standards that meet the specified criteria.
- B. The terms “approved equal”, “equivalent”, or “equal” are used synonymously and shall mean “accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified”. The term “approved” shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

1.5 COORDINATION

- A. The Contractor shall visit the site and ascertain the conditions to be encountered while installing the Work under this Division, verify all dimensions and locations before purchasing equipment or commencing work, and make due provision for same in the bid. Failure to comply with this requirement shall not be considered justification for omission, alteration, incorrect or faulty installation of Work under this Division or for additional compensation for Work covered by this Division.
- B. The Contractor shall refer to Drawings of the other disciplines and to relevant equipment drawings and shop drawings to determine the extent of clear spaces. The Contractor shall make offsets required to clear equipment, beams and other structural members; and to facilitate concealing piping and ductwork in the manner anticipated in the design.
- C. The Contractor shall confirm and coordinate the final location and routing of all mechanical, electrical, plumbing, fire protection, control and audio-visual systems with all architectural features, structural components, and other trades. The contractor shall locate equipment, components, ductwork, piping, conduit, and related accessories to maintain the desired ceiling heights as indicated on the architectural drawings. The contractor shall inform the architect of any areas where conflicts may prevent the indicated ceiling height from being maintained. The contractor shall not proceed with any installation in such areas until the architect has given written approval to proceed or has provided modified contract drawings or written instructions to resolve the apparent conflict.
- D. Provide materials with trim that will fit properly the types of ceiling, wall, or floor finishes actually installed.
- E. Contractor shall maintain a foreman on the jobsite at all times to coordinate his work with other contractors and subcontractors so that various components of the mechanical systems will be installed at the proper time, will fit the available space, and will allow proper service access to the equipment. Carry on the Work in such a manner that the Work of the other contractors and trades will not be handicapped, hindered, or delayed at any time.

- F. Work of this Division shall progress according to the "Construction Schedule" as established by the Prime Contractor and his subcontractors and as approved by the Architect. Cooperate in establishing these schedules and perform the Work under this Division, in a timely manner in conformance with the construction schedule so as to insure successful achievement of schedule dates.
- G. Roof Top Units – Purchase order to be executed a minimum of 8 weeks prior to delivery (refer to Material Responsibility matrix and List of Required Vendors & Contractors). General Contractor responsible for coordinating roof top unit delivery.

1.6 MEASUREMENTS AND LAYOUTS

- A. The Drawings are schematic in nature, but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the Work. Figured dimensions take precedence to scaled dimensions. Determine exact locations by job measurements, by checking the requirements of other trades, and by reviewing all Contract Documents. Correct, at no additional costs to the Owner, errors that could have been avoided by proper checking and inspection.

1.7 SUBMITTALS

- A. Refer to Division 01 and General Conditions for submittal requirements.
- B. Assemble and submit for review, manufacturers' product literature for material and equipment to be furnished, installed, or both, under this Division, including shop drawings, manufacturers' product data and performance sheets, samples, and other submittals required by this Division.
- C. Provide submittals in sufficient detail so as to demonstrate compliance with these Contract Documents and the design concept. Highlight, mark, list or indicate the materials, performance criteria and accessories that are being proposed.
- D. Refer to individual Sections for additional submittal requirements.
- E. Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus to/from mailing time via the Architect, plus a duplication of this time for resubmittals, if required. Transmit submittals as soon as possible after Notice to Proceed and before construction starts.
- F. Before transmitting submittals and material lists, verify that the equipment submitted is mutually compatible with and suitable for the intended use. Verify that the equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- G. Submittals shall contain the following information. Submittals not so identified will be returned to the Vendor without action:
 - 1. The project name.
 - 2. The applicable Specification Section and paragraph.

3. The submittal date.
 4. The Contractor's stamp, which shall certify that the stamped drawings have been checked by the Contractor, comply with the Drawings and Specifications, and have been coordinated with other trades.
- H. The Engineer's checking and subsequent acceptance of such submittals shall not relieve the Vendor from responsibility for deviations from Drawings or Specifications unless Vendor has, in writing, called the Engineer's and Architect's attention to such deviations at the time of submission, and secured written acceptance; nor shall it relieve Vendor from responsibility for errors in dimensions, details, sizes of members, or quantities; or for omissions of components or fittings; or for not coordinating items with actual building conditions and adjacent work.

1.8 ELECTRONIC DRAWING FILES

- A. In preparation of shop drawings or record drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DXF format from the Engineer. Contact the Architect for Architect's written authorization. In addition to payment, Architect's written authorization and data licensing agreement form must be received before electronic drawing files will be sent.
1. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 2. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
 3. Unless otherwise specified in writing, a check made payable to pb2 Architecture + Engineering. For a shipping and handling fee of \$200 for a drawing set up to 12 sheets and \$15 per sheet for each additional sheet shall accompany the request for files.
 4. Contractor shall indicate the desired shipping method and drawing format with the request.

1.9 SUBSTITUTIONS

- A. Refer to Bid Documents, General and Supplementary Conditions and Division 01 Specification Sections for limitations and restrictions on substitutions.
- B. Materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution.
- C. No substitutions will be considered with receipt of Bids, unless the Architect and Engineer have received from the Vendor a written request for approval to bid a substitution at least ten calendar days prior to the date for receipt of Bids, and have approved the substitution request. Include, with each such request, the name of the material or equipment for which substitution is being requested, and a complete description of the proposed substitution, including drawings, cut sheets, performance and test data, and all other information necessary for an evaluation. Include also a statement setting forth changes in other materials, equipment or other work that would be required to incorporate the substitution. The burden of proof of the merit of the

proposed substitute is upon the proposer. The Architect's or Engineer's decision to approve or disapprove a substitution in a Bid is final.

- D. If the proposed substitution is approved prior to receipt of Bids, such approval will be stated in an Addendum. Bidders shall not rely upon approvals made in any other manner, including verbal.
- E. No substitutions will be considered after receipt of Bids and before award of the Contract.

1.10 OPERATION AND MAINTENANCE DATA

- A. Refer to Division 01 and General Conditions for Operation and Maintenance Data.
- B. Submit data prior to requesting the final punch list and before all requests for Substantial Completion.
- C. Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division.
- D. Prior to Substantial Completion of the project, furnish to the Architect, for Engineer's review, and for the Owner's use, four (4) copies of brochures in three-ring, loose-leaf, hard-back notebook form, divided and tabbed, containing equipment data, approved submittals, shop drawings, diagrams, capacities, spare part numbers, manufacturer's service and maintenance data, warranties, guarantees, etc. Include local contacts complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications.

1.11 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish spare parts and extra materials specified in the individual sections of this Division and as specified in Section 017700.

1.12 RECORD DRAWINGS

- A. Keep a set of jobsite work prints of the Issued for Construction Drawings on the jobsite during construction, for the purpose of annotating changes. During the course of construction, indicate on these Documents, changes made from the Conformed Contract Documents. Pay particular attention to those items that require locating for servicing.
- B. At the completion of the project, incorporate changes noted on the jobsite work prints onto a complete set of Drawings to serve as Record Drawings. Mark each sheet "Record Drawing", along with the date, and deliver these Record Drawings to the Architect as outlined in Drawings in Division 01, Section "Project Record Documents".

1.13 DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 01 and General Conditions for Delivery, Storage and Handling.

- B. Deliver equipment and material to the job site in their original containers with labels intact, fully identified with manufacturer's name, make, model, model number, type, size, capacity and Underwriter's Laboratories, Inc. labels and other pertinent information necessary to identify the item.
- C. Deliver, receive, handle and store equipment and materials at the job site in the designated area and in such a manner as to prevent equipment and materials from damage and loss. Store equipment and materials delivered to the site on pallets and cover with waterproof, tear resistant tarp or plastic or as required to keep equipment and materials dry. Follow manufacturer's recommendations, and at all times, take every precaution to properly protect equipment and material from damage, including the erection of temporary shelters to adequately protect equipment and material stored at the Site. Equipment and/or material which becomes rusted or damaged shall be replaced or restored by the Contractor to a condition acceptable to the Architect and Engineer.
- D. Be responsible for the safe storage of tools, material and equipment.

1.14 WARRANTIES

- A. Refer to Division 01 and General Conditions for Warranties.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- C. Warrant each system and each element thereof against all defects due to faulty workmanship, design or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty in these Construction Documents or manufacturer's standard warranty exceeds 12 months. Remedy all defects, occurring within the warranty period(s), as stated in the General Conditions and Division 01
- D. Also warrant the following additional items:
 - 1. Piping shall be free from obstructions, holes or breaks or any nature.
 - 2. Insulation are effective.
 - 3. Proper circulation of fluid in each piping system.
- E. The above warranties shall include labor and material. Make repairs or replacements without any additional costs to the Owner.
- F. Perform the remedial work promptly, upon written notice from the Architect or Owner.
- G. At the time of Substantial Completion, deliver to the Owner all warranties, in writing and properly executed, including term limits for warranties extending beyond the one year period, each warranty instrument being addressed to the Owner and stating the commencement date and term. Refer to Table 2 at the end of this section for a list of specification sections in Division 23 that contain special warranties.

1.15 TRAINING

- A. Provide training as indicated in each specific section. Schedule training with the Owner at least 7 days in advance. Video tape the training sessions in format as agreed to with the Owner. Provide three copies of each session to the Owner and obtain written receipt from the Owner.

1.16 PAINTING

- A. Exposed ferrous surfaces, including pipe, pipe hangers, equipment stands and supports shall be painted by the Contractor using materials and methods as specified under Division 9 of the Specifications; colors shall be as selected by the Architect.
- B. Factory finishes, shop priming and special finishes are specified in the individual equipment specification sections.
- C. Where factory finishes are provided and no additional field painting is specified, marred or damaged surfaces shall be touched up or refinished so as to leave a smooth, uniform finish.

1.17 TEMPORARY FACILITIES

- A. Refer to Division 01 and General Conditions for Temporary Facilities requirements.
- B. Temporary Utilities: The types of services required include, but are not limited to, water, sewerage, surface drainage and gas. When connecting to existing franchised utilities for required services, comply with service companies' recommendations on materials and methods, or engage service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations.
 - 1. Water: Premises are supplied with water services which may be used in this work: Contractor shall make his own arrangements for water services.
 - 2. If premises are not supplied with water services, provide the necessary backflow prevention devices where connecting to the potable water system. Protect water service from freezing by draining system or by providing adequate heat. Where non-potable water is used, mark each outlet with health hazard warning signs.
 - 3. Sewer Sediment: Maintain sewers and temporary connecting sewers in a clean, non-clogged condition during construction period.
- C. Construction Facilities: Provide facilities reasonably required to perform construction operations properly and adequately.
 - 1 Enclosures: When temporary enclosures are required to ensure adequate workmanship, weather protection and ambient conditions required for the work, provide fire-retardant treated lumber and plywood; provide tarpaulins with UL label and flame spread of 15 or less; provide translucent type (nylon reinforced polyethylene) where daylighting of enclosed space would be beneficial for workmanship, and reduce use of temporary lighting.
 - 2 Heating: Provide heat, as necessary, to protect work, materials and equipment from damage due to dampness and cold. In areas where building is occupied, maintain a temperature not less than 65 degrees F. Use steam, hot water, or gas

from piped distribution system where available. Where steam, hot water or piped gas are not available, heat with self-contained LP gas or fuel oil heaters, bearing UL, FM or other approval labels appropriate for application. Vent fuel-burning heaters, and equip units with individual-space thermostatic controls. Use electric-resistance space heaters only where no other, more energy-efficient, type of heater is available and allowable.

1.18 PROJECT CONDITIONS

- A. Conditions Affecting Excavations: The following project conditions apply:
 - 1. Maintain and protect existing building services that transit the area affected by selective demolition.
 - 2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations.
- B. Site Information: Subsurface conditions were investigated during the design of the Project. Reports of these investigations are available for information only; data in the reports are not intended as representations or warranties of accuracy or continuity of conditions. The Owner will not be responsible for interpretations or conclusions drawn from this information.
- C. Use of explosives is not permitted.
- D. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits specified by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.

PART 2 - EXECUTION

2.1 PERMITS

- A. Secure and pay for permits required in connection with the installation of the Mechanical Work. Arrange with the various utility companies for the installation and connection of required utilities for this facility and pay charges associated therewith including connection charges and inspection fees, except where these services or fees are designated to be provided by others.

2.2 EXISTING UTILITIES

- A. Schedule and coordinate with the Utility Company, Owner and with the Engineer connection to, or relocation of, or discontinuation of normal utility services from existing utility lines. Premium time required for any such work shall be included in the bid.
- B. Existing utilities damaged due to the operations of utility work for this project shall be repaired to the satisfaction of the Owner or Utility Company without additional cost.
- C. Utilities shall not be left disconnected at the end of a work day or over a weekend unless authorized by representatives of the Owner or Engineer.

- D. Repairs and restoration of utilities shall be made before workmen leave the project at the end of the workday in which the interruption takes place.
- E. Contractor shall include in his bid the cost of furnishing temporary facilities to provide services during interruption of normal utility service.

2.3 CUTTING AND PATCHING

- A. The Contractor shall do necessary cutting of walls, floors, ceilings and roofs.
- B. No structural member shall be cut without permission from Architect.
- C. Patch around openings to match adjacent construction.
- D. After the final waterproofing membrane has been installed, roofs may be cut only with written permission by the Architect.

2.4 CLEANING

- A. Dirt and refuse resulting from the performance of the work shall be removed from the premises as required to prevent accumulation. The Mechanical Contractor shall cooperate in maintaining reasonably clean premises at all times.
- B. Immediately prior to the final inspection, the Mechanical Contractor shall clean material and equipment installed under the Mechanical Contract. Dirt, dust, plaster, stains, and foreign matter shall be removed from surfaces including components internal to equipment. Damaged finishes shall be touched-up and restored to their original condition.

2.5 SUBSTANTIAL COMPETITION REVIEW

- A. Prior to requesting inspection for "CERTIFICATE OF SUBSTANTIAL COMPLETION", the Contractor shall complete the following items:
 - 1. Submit complete Operation and Maintenance Manuals.
 - 2. Submit complete Record Drawings.
 - 3. Perform special inspections. Refer to Table 3 at the end of this section for a list of specification sections in Division 23 that contain special inspection requirements.
 - 4. Start-up testing of systems.
 - 5. Removal of temporary facilities from the site.
 - 6. Comply with requirements for Substantial Completion in the "General Conditions".
- B. The Contractor shall request in writing a review for Substantial Completion. The Contractor shall give the Architect/Engineer at least seven (7) days notice prior to the review.
- C. The Contractor's written request shall state that the Contractor has complied with the requirements for Substantial Completion.

- D. Upon receipt of a request for review, the Architect/Engineer will either proceed with the review or advise the Contractor of unfulfilled requirements.
- E. If the Contractor requests a site visit for Substantial Completion review prior to completing the above mentioned items, He shall reimburse the Architect/Engineer for time and expenses incurred for the visit.
- F. Upon completion of the review, the Architect/Engineer will prepare a "final list" of outstanding items to be completed or corrected for final acceptance.
- G. Omissions on the "final list" shall not relieve the Contractor from the requirements of the Contract Documents.
- H. Prior to requesting a final review, the Contractor shall submit a copy of the final list of items to be completed or corrected. He shall state in writing that each item has been completed, resolved for acceptance or the reason it has not been completed.

END OF SECTION 230010

Table 2: SPECIAL WARRANTY REQUIREMENTS FOR MECHANICAL EQUIPMENT

	<u>Section Number/Title</u>	<u>Received</u> <u>Date/Initial</u>
237413	Packaged, Outdoor, Central-Station Air-Handling Units	_____
238126	Split-System Air-Conditioners	_____

Table 3: SPECIAL INSPECTION REQUIREMENTS FOR MECHANICAL EQUIPMENT

<u>Section Number/Title</u>		<u>Received</u> <u>Date/Initial</u>
230550	Vibration Isolation for HVAC Equipment	

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SECTION 230015 – ELECTRICAL COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies the basic requirements for electrical components which are an integral part of packaged mechanical equipment. These components include, but are not limited to factory furnished motors, starters, and disconnect switches furnished as an integral part of packaged mechanical equipment.
- B. Specific electrical requirements (i.e. horsepower and electrical characteristics) for mechanical equipment are scheduled on the Drawings.
- C. System shall be complete and operational with power and control wiring provided to meet the design intent shown on the drawings and specified within the specification sections.

1.2 SUBMITTALS

- A. No separate submittal is required. Submit product data for motors, starters and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification Sections.

1.3 QUALITY ASSURANCE

- A. Electrical components and materials shall be UL labeled.
- B. All electrical equipment provided, and the wiring and installation of electrical equipment shall be in accordance with the requirements of this Section and Division 26.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The Contractors shall provide all motors, starters, disconnects, wire, conduit, etc. as specified in the Construction Documents. If, however, the Division 23 Contractor furnishes a piece of equipment requiring a different motor, starter, disconnect, wire size, etc. than what is shown and/or intended on the Construction Documents, this Trade shall coordinate the requirements with any other Trade and shall be responsible for any additional cost incurred by any other Trade that is associated with installing the different equipment and related accessories for proper working condition.
- B. Refer to Section 260010, "General Electrical Requirements" for general electrical installation.
- C. Refer to Section 262816 "Enclosed Switches and Circuit Breakers" for specification of disconnect switches and enclosed circuit breakers.

PART 3 - EXECUTION

3.1 CONTRACTOR COORDINATION

- A. Unless otherwise indicated, all motors, equipment, controls, etc. shall be furnished, set in place and wired in accordance with Table 1. Any items not listed but shown on the drawings shall be considered part of the Contract Documents and brought to the attention of the Architect.
- B. The Contractor is the central authority governing the total responsibility of all trade contractors. Therefore, deviations and clarifications of this schedule are permitted provided the Contractor assumes responsibility to coordinate the trade contractors differently than as indicated herein. If deviations or clarifications to this schedule are implemented, submit a record copy to the Engineer.

ITEM	FURN BY	SET BY	POWER WIRING	CONTRO L WIRING
Equipment motors	DIV23	DIV23	DIV26	--
Factory furnished motor starters, contactors and disconnects	DIV23	DIV23	DIV26	DIV23
Loose motor starters, disconnect switches, thermal overloads, and heaters.	DIV26	DIV26	DIV26	DIV23
Control relays and transformers	DIV23	DIV23	DIV26	DIV25
Thermostats (low voltage)	DIV25	DIV25	--	DIV25
Thermostats (line voltage)	DIV23	DIV23	DIV26	--
Time switches (for mechanical equipment)	DIV25	DIV25	DIV26	DIV25
Smoke detectors	DIV28	DIV28	DIV28	DIV28
Temporary heating connections	DIV23	DIV23	DIV26	DIV23

DIV23 = Mechanical Trade
DIV25 = Automation System
Trade
DIV26 = Electrical Trade

3.2 TABLE 1: ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

END OF SECTION 230015

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel, Plastic, Stainless steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating or stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; recommended for interior and exterior applications.

- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. Verify PVC sleeves are not prohibited by AHJ.
- C. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- D. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- E. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- F. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space

between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves, Galvanized-steel-pipe sleeves, or PVC-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves or Galvanized-steel-pipe sleeves.
2. Exterior Concrete Walls below Grade:
 - a. Piping: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 2) For piping passing through or under foundation, sleeves shall be two nominal pipe sizes larger than the pipe served
3. Concrete Slabs-on-Grade:
 - a. Piping: Cast-iron wall sleeves with sleeve-seal system or PVC-pipe sleeves.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
4. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.
 - b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 230517

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SECTION 230529 - HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick
 - 5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting"
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

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SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Open-spring isolators.
3. Spring hangers.
4. Restraint channel bracings.
5. Restraint cables.
6. Seismic-restraint accessories.

1.2 ACTION SUBMITTALS

A. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed (3-second gust): **<Insert value>**.
2. Building Classification Category: **[I] [II] [III] [IV]**.
3. Minimum 10 lb/sq. ft. multiplied by maximum area of HVAC component projected on vertical plane normal to wind direction, and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: **[A] [B] [C] [D] [E] [F]**.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: **[I] [II] [III]**.
 - a. Component Importance Factor: **[1.0] [1.5] <Insert value>**.
 - b. Component Response Modification Factor: **[1.5] [2.5] [3.5] [5.0] <Insert value>**.
 - c. Component Amplification Factor: **[1.0] [2.5] <Insert value>**.
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): **<Insert number>**.
4. Design Spectral Response Acceleration at 1.0-Second Period: **<Insert number>**.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads: Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber Booth.
2. California Dynamics Corporation.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc.
7. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
8. Size: Factory or field cut to match requirements of supported equipment.
9. Pad Material: Oil and water resistant with elastomeric properties.
10. Infused nonwoven cotton or synthetic fibers.
11. Load-bearing metal plates adhered to pads.

2.3 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators: Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber Booth.
2. California Dynamics Corporation.

3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc.

2.4 SPRING HANGERS

- A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression: Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber Booth.
2. California Dynamics Corporation.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.
5. Vibration Eliminator Co., Inc.
6. Vibration Mountings & Controls, Inc.

2.5 RESTRAINT CHANNEL BRACINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hilti, Inc.
3. Mason Industries, Inc.
4. Unistrut; an Atkore International company.

- B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.6 RESTRAINT CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Loos & Co., Inc.
3. Mason Industries, Inc.
4. Vibration Mountings & Controls, Inc.

- B. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.7 SEISMIC-RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
 2. Kinetics Noise Control, Inc.
 3. Mason Industries, Inc.
 4. TOLCO.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Refer to Section 233113 "Metal Ducts" for ductwork supporting systems.
- B. HVAC units suspended from overhead structure shall be hung by Open-spring isolators or Spring hangers. Unless otherwise specified, the static deflection of the isolators shall be 2".
- C. All equipment, piping, etc. shall be mounted on or suspended from approved foundations and supports, all as specified herein, or as shown on the drawings.
- D. Furnish and install neoprene mounting sleeves for hold-down bolts to prevent any metal to metal contact.
- E. All equipment shall be provided with lateral restraining isolators as required to limit horizontal motion to 1/4" maximum, under all operating conditions. Lateral restraining isolators shall have the same static deflection as the vertical isolators for the equipment being isolated.
- F. Unless otherwise indicated, all equipment mounted on vibration isolators shall have a minimum operating clearance of 2 inches between the bottom of the equipment or inertia base (and height-saving bracket) and the concrete housekeeping pad (or bolt heads) beneath the equipment. The clearance shall be checked by the Contractor to ensure that no material has been left to short-circuit the vibration isolators.

- G. Piping, ductwork, conduit or mechanical equipment shall be supported from building structure, not hung from or supported on other equipment, pipes, or ductwork.
- H. Ducts shall be connected to fans, fan casings and fan plenums by means of flexible connectors. Flexible duct connectors shall not be used outside the mechanical room unless expressly shown on the drawings. Refer to Section 233300 "Air Duct Accessories" for ductwork flexible connectors.
- I. All HVAC piping and equipment not specifically identified in this specification that contains rotating or vibrating elements, and any associated electrical apparatus installed by this division that contains transformers or inductors shall be installed on neoprene isolators as appropriate.
- J. All wiring connections to mechanical equipment on isolators shall be made with a minimum 18 inch long flexible conduit in a "U" shaped loop.
- K. Elastomeric isolators that will be exposed to temperatures below 32 degrees F shall be fabricated from natural rubber instead of neoprene.
- L. Springs shall be designed and installed so that ends of springs remain parallel and all springs installed with adjustment bolts.
- M. Springs shall be sized to be non-resonant with equipment forcing frequencies or support structure natural frequencies.
- N. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction.
- O. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- P. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- D. Equipment Restraints:

1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Piping Restraints:
1. Comply with requirements in MSS SP-127.
 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 3. Brace a change of direction longer than 12 feet.
- F. Install cables so they do not bend across edges of adjacent equipment or building structure.
- G. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- K. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
 - 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 4. Test to 90 percent of rated proof load of device.
 - 5. Measure isolator restraint clearance.
 - 6. Measure isolator deflection.
 - 7. Verify snubber minimum clearances.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION 230548

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SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.

1.2 SPARE PARTS AND EXTRA MATERIALS

A. Furnish extra materials as specified in Section 017700.

B. Furnish minimum of 5% extra stock of each mechanical identification material required, including additional numbered valve tags (not less than 3) for each piping system, additional piping system identification markers, and additional plastic laminate engraving blanks of assorted sizes.

1. Where stenciled markers are provided, clean and retain stencils after completion of stenciling and include used stencils in extra stock, along with required stock of stenciling paints and applicators.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allen Systems, Inc.
 - b. Brady Corporation.
 - c. Industrial Safety Supply Co. Inc.
 - d. Seton Identification Products.
2. Material and Thickness: Brass, 0.032-inch stainless steel, 0.025-inch aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allen Systems, Inc.
 - b. Brady Corporation.
 - c. Industrial Safety Supply Co. Inc.
 - d. Seton Identification Products.
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Vinyl Labels for Equipment Identification:

1. Size: 4 inch high, block letters or numbers.
2. Color: Black.
3. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
4. Location: Used only at RTU supply duct as specified herein.

D. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

E. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allen Systems, Inc.

2. Brady Corporation.
 3. Industrial Safety Supply Co. Inc.
 4. Seton Identification Products.
- B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- C. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- D. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- E. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- F. Fasteners: Stainless-steel rivets or self-tapping screws.
- G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- H. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Allen Systems, Inc.
 2. Brady Corporation.
 3. Industrial Safety Supply Co. Inc.
 4. Seton Identification Products.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- C. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 DUCT LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allen Systems, Inc.
 - 2. Brady Corporation.
 - 3. Industrial Safety Supply Co. Inc.
 - 4. Seton Identification Products.
- B. Material and Thickness: Multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- C. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- D. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- E. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- F. Fasteners: Stainless-steel rivets or self-tapping screws.
- G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- H. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.
- C. Locate RTU equipment identification (vinyl labels) at back side of supply duct as indicated on Mechanical Drawings.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.4 DUCT LABEL INSTALLATION

- A. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 230553

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SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General Contractor shall coordinate with NexRev to perform the Test & Balance and submit the Test & Balance reports to the Owner and AOR.
2. Balancing Air Systems:
 - a. Constant-volume air systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.

1.3 INFORMATIONAL SUBMITTALS

- A. Strategies and Procedures Plan: Submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

1.4 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC or NEBB.
 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.
 2. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices such as manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- I. Examine operating safety interlocks and controls on HVAC equipment.
- J. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

2.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures for balancing the systems.

- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

- 1. Airside:

- a. Duct systems are complete with terminals installed.
- b. Volume, smoke, and fire dampers are open and functional.
- c. Clean filters are installed.
- d. Fans are operating, free of vibration, and rotating in correct direction.
- e. Automatic temperature-control systems are operational.
- f. Ceilings are installed.
- g. Windows and doors are installed.
- h. Suitable access to balancing devices and equipment is provided.

2.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

2.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

2.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from either the Architect, Owner, or commissioning authority for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated unit performance.

5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.

2.6 TOLERANCES

- A. Set HVAC system's airflow within the following tolerances:
1. Balance individual terminal devices and branch lines to ± 10 percent and main ducts and air handling equipment to ± 5 percent of specified airflow.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

2.7 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
 4. Provide the Test & Balance report to owner and AOR.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
 2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Notes to explain why certain final data in the body of reports vary from indicated values.
 14. Test conditions for fans performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Settings for supply-air, static-pressure controller.
 - g. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Duct, outlet, and inlet sizes.
 3. Balancing stations.
 4. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.

- h. Sheave make, size in inches, and bore.
- i. Center-to-center dimensions of sheave and amount of adjustments in inches.
- j. Number, make, and size of belts.
- k. Number, type, and size of filters.

2. Motor Data:

- a. Motor make, and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches, and bore.
- f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm.
- b. Total system static pressure in inches wg.
- c. Fan rpm.
- d. Discharge static pressure in inches wg.
- e. Filter static-pressure differential in inches wg.
- f. Cooling-coil static-pressure differential in inches wg.
- g. Outdoor airflow in cfm.
- h. Return airflow in cfm.
- i. Outdoor-air damper position.
- j. Return-air damper position.

F. Fan Test Reports: For exhaust fans, include the following:

1. Fan Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and size.
- e. Manufacturer's serial number.
- f. Arrangement and class.
- g. Sheave make, size in inches, and bore.
- h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

- a. Motor make, and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches, and bore.

- f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
- 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- G. Round, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 - 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- H. Instrument Calibration Reports:
 - 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

2.8 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Construction Manager.
- B. Commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
- F. Prepare test and inspection reports.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:

1. Indoor supply, return, exhaust

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type II with factory-applied vinyl jacket, or Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

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

- a. Aeroflex USA, Inc.
- b. Armacell LLC.
- c. Babcock and Wilcox; Insulating Products Div.
- d. CertainTeed Corporation.
- e. Johns Manville; a Berkshire Hathaway company.
- f. Knauf Insulation.
- g. Nomaco K-Flex, LLC.
- h. Owens Corning.

- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ or with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

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

- a. Aeroflex USA, Inc.
- b. Armacell LLC.
- c. Babcock and Wilcox; Insulating Products Div.
- d. CertainTeed Corporation.
- e. Johns Manville; a Berkshire Hathaway company.
- f. Knauf Insulation.
- g. Nomaco K-Flex, LLC.
- h. Owens Corning.

2.2 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 1-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- D. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: 60 percent by volume and 66 percent by weight.

2.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: Aluminum.
- B. ASJ Flashing Sealants, and Vinyl Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 - 4. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 6.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.8 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Insulation Pins and Hangers:
 - 1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
 - 2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
 - b. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.

- c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
- 3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive-backed base with a peel-off protective cover.
- 4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- 5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- D. Wire: 0.062-inch soft-annealed, stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Insulate neck and bells of supply diffusers.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For *below* ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

- a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

- b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
- 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
- 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

- 1. Indoor, concealed supply, return and exhaust.

B. Items Not Insulated:

- 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1. Refer to drawings for specified locations.
- 2. Factory-insulated flexible ducts.
- 3. Factory-insulated plenums and casings.
- 4. Flexible connectors.
- 5. Vibration-control devices.
- 6. Factory-insulated access panels and doors.

3.6 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, Supply-Air, Return-Air, and Exhaust Air Duct and Plenum Insulation: Mineral-fiber blanket 2" thick, minimum R-5 or board 1-1/2" thick with minimum R-5.

END OF SECTION 230713

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SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.
 - 6. Service meters.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
- B. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of seismic restraints.
 - 2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:

1.7 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 SPARE PARTS

- A. Valve Wrenches: Furnish to Owner, with receipt, 2 valve wrenches for each type of gas valve installed, requiring same.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
 - 1. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
 - 2. Coating: PE with flame retardant.
 - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1) Flame-Spread Index: 25 or less.
 - 2) Smoke-Developed Index: 50 or less.
 - 3. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.

4. Striker Plates: Steel, designed to protect tubing from penetrations.
5. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
6. Operating-Pressure Rating: **5 psig**.

C. Aluminum Tubing: Comply with ASTM B 210 and ASTM B 241/B 241M.

1. Aluminum Alloy: Alloy 5456 is prohibited.
2. Protective Coating: Factory-applied coating capable of resisting corrosion on tubing in contact with masonry, plaster, insulation, water, detergents, and sewerage.
3. Flare Fittings: Comply with ASME B16.26 and SAE J513.
 - a. Copper-alloy fittings.
 - b. Metal-to-metal compression seal without gasket.
 - c. Dryseal threads shall comply with ASME B1.20.3.

D. Annealed-Temper Copper Tube: Comply with **ASTM B 88, Type L**.

1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Flare Fittings: Comply with ASME B16.26 and SAE J513.
 - a. Copper fittings with long nuts.
 - b. Metal-to-metal compression seal without gasket.
 - c. Dryseal threads complying with ASME B1.20.3.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: **0.5 psig**.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: **72 inches**

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.

2. End Connections: Threaded ends for **NPS 2** and smaller; flanged ends for **NPS 2-1/2** and larger.
 3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
 4. CWP Rating: **125 psig**.
- D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than **1000 deg F** complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for Metallic Valves, **NPS 2** and Smaller: Comply with ASME B16.33.
 1. CWP Rating: **125 psig**.
 2. Threaded Ends: Comply with ASME B1.20.1.
 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves **1 inch** and smaller.
 6. Service Mark: Valves **1-1/4 inches** to **NPS 2** shall have initials "WOG" permanently marked on valve body.
- B. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. BrassCraft Manufacturing Co.; a Masco company.
 - c. Conbraco Industries, Inc.
 - d. Lyall, R. W. & Company, Inc.
 - e. Perfection Corporation.
 2. Body: Bronze, complying with ASTM B 584.
 3. Ball: Chrome-plated bronze.

4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE.
6. Packing: Threaded-body pack-nut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 EARTHQUAKE VALVES

A. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. California Valves.
 - b. Little Fire Fighter Gas Safety Products.
 - c. Pacific Seismic Products.
 - d. Vanguard Valves, Inc.
2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
3. Maximum Operating Pressure: 5 psig.
4. Cast-aluminum body with nickel-plated chrome steel internal parts.
5. Nitrile-rubber valve washer.
6. Sight windows for visual indication of valve position.
7. Threaded end connections complying with ASME B1.20.1.
8. Wall mounting bracket with bubble level indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

C. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Actaris.
 - b. American Meter Company.
 - c. Eclipse Innovative Thermal Technologies.

- d. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
 - e. Invensys.
 - f. Itron Gas.
 - g. Maxitrol Company.
 - h. Richards Industries.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
 3. Springs: Zinc-plated steel; interchangeable.
 4. Diaphragm Plate: Zinc-plated steel.
 5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
 6. Orifice: Aluminum; interchangeable.
 7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
 9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
 10. Overpressure Protection Device: Factory mounted on pressure regulator.
 11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
 12. Maximum Inlet Pressure: 10 psig.

D. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Canadian Meter Company Inc.
 - b. Eaton Corporation.
 - c. Harper Wyman Co.
 - d. Maxitrol Company.
 - e. SCP, Inc.
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 5 psig.

2.7 SERVICE METERS

A. Diaphragm-Type Service Meters: Comply with ANSI B109.2.

1. Case: Die-cast aluminum.
2. Connections: Steel threads.
3. Diaphragm: Synthetic fabric.
4. Diaphragm Support Bearings: Self-lubricating.
5. Compensation: Continuous temperature and pressure.
6. Meter Index: Cubic feet.
7. Meter Case and Index: Tamper resistant.
8. Remote meter reader compatible.
9. Maximum Inlet Pressure: 100 psig.
10. Pressure Loss: Maximum 0.5-inch wg.
11. Accuracy: Maximum plus or minus 1.0 percent.

B. Rotary-Type Service Meters: Comply with ANSI B109.3.

1. Case: Extruded aluminum.
2. Connection: Flange.
3. Impellers: Polished aluminum.
4. Rotor Bearings: Self-lubricating.
5. Compensation: Continuous temperature and pressure.
6. Meter Index: Cubic feet.
7. Tamper resistant.
8. Remote meter reader compatible.
9. Maximum Inlet Pressure: 100 psig.
10. Accuracy: Maximum plus or minus 2.0 percent.

2.8 DIELECTRIC FITTINGS

A. Dielectric Unions:

1. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 psig minimum at 180 deg F.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.9 LABELING AND IDENTIFYING

- ### A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Install underground, natural-gas piping buried at least **36 inches** below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
 - 1. If natural-gas piping is installed less than **36 inches** below finished grade, install it in containment conduit.
- C. Install underground, PE, natural-gas piping according to ASTM D 2774.
- D. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
 - 3. Replace pipe having damaged PE coating with new pipe.
- E. Copper Tubing with Protective Coating:
 - 1. Apply joint cover kits over tubing to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
- F. Install fittings for changes in direction and branch connections.
- G. Install pressure gage downstream from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.2 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than **3 inches** long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- Q. Connect branch piping from top or side of horizontal piping.
- R. Install unions in pipes **NPS 2** and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- S. Do not use natural-gas piping as grounding electrode.
- T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- U. Install pressure gage downstream from each line regulator.

- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 SERVICE-METER ASSEMBLY INSTALLATION

- A. Install service-meter assemblies above ground.
- B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.
- C. Install strainer on inlet of service-pressure regulator and meter set.
- D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.
- E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.
- F. Install service meters downstream from pressure regulators.

3.4 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install earthquake valves aboveground outside buildings according to listing.

3.5 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.

4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.6 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

D. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2 and NPS 5/8: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and NPS 7/8: Maximum span, 84 inches; minimum rod size, 3/8 inch.
4. NPS 1: Maximum span, 96 inches; minimum rod size, 3/8 inch.

E. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.7 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within **72 inches** of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.8 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, **12 inches** below finished grade, except **6 inches** below subgrade under pavements and slabs.

3.9 PAINTING

- A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior natural-gas piping.
- B. Prime and paint exterior gas piping before installation. Refer to Architectural Finish Schedule for pipe paint finishes.

3.10 ELECTRICAL BONDING AND GROUNDING

- A. Install above ground portions of gas piping systems, upstream from equipment shutoff valves electrically continuous and bonded to a grounding electrode in accordance with NFPA 70 -"National Electrical Code."
- B. Do not use gas piping as a grounding electrode.
- C. Conform to NFPA 70 -"National Electrical Code," for electrical connections between wiring and electrically operated control devices.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test, inspect, and purge natural gas according to NFPA 54, the International Fuel Gas Code, and authorities having jurisdiction.

- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
 - 1. Refer to the inspection report form at the end of this section for inspection data to be completed for each piping system. Submit completed forms to the Owner and Engineer.

3.12 PIPING SCHEDULE:

- A. Aboveground, distribution piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints for 2" and smaller
 - 2. Steel pipe with steel welding fittings and welded joints for 2-1/2" and larger.
 - 3. Corrugated, stainless-steel tubing for 2" and smaller.
 - 4. Drawn-temper copper tube with wrought-copper fittings and brazed joints.
- B. Underground, below building, piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints for 2" and smaller
 - 2. Steel pipe with steel welding fittings and welded joints for 2-1/2" and larger.
 - 3. Corrugated, stainless-steel tubing for 2" and smaller.
- C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.
- D. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.13 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.
- B. Underground:
 - 1. PE bronze plug valves.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes **NPS 2** and smaller at service meter shall be the following:
 - 1. Two-piece, regular-port, bronze ball valves with bronze trim.
- B. Distribution and branch piping valves for pipe sizes **NPS** and smaller shall be the following:
 - 1. Two-piece, regular-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.

END OF SECTION 231123

PLUMBING & PLUMBING PIPING SYSTEMS
INSPECTION REPORT FORM

Project Name: _____

Project No : _____

General Contractor: _____

Contractor Project No: _____

Inspection Date: _____

Temperature: _____

System Inspected

Building: _____

Location/Description: _____

Service: _____

Inspection Results

Remarks:

Contractor Supervisor's signature: _____

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Double-wall round ducts and fittings.
 - 4. Sheet metal materials.
 - 5. Duct liner.
 - 6. Sealants and gaskets.
 - 7. Hangers and supports.
 - 8. Seismic-restraint devices.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.
 - 1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
 - 2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
 - 3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

1.4 ACTION SUBMITTALS

- A. Product Data: For Duct liner.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements,

materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 DOUBLE-WALL ROUND DUCTS AND FITTINGS

- A. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Inner Duct: Minimum 0.028-inch solid sheet steel.
- C. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.

3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 1. Galvanized Coating Designation: G90.
 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aeroflex USA, Inc.
 - b. Armacell LLC.
 - c. Babcock and Wilcox; Insulating Products Div.
 - d. CertainTeed Corporation.
 - e. Johns Manville; a Berkshire Hathaway company.
 - f. Knauf Insulation.
 - g. Nomaco, LLC.
 - h. Owens Corning.
 - 1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 2. Solvent or Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
- B. Insulation Pins and Washers:
 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
 7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.

2.6 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 2. Tape Width: 3 inches.
 3. Sealant: Modified styrene acrylic.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 7. Service: Indoor and outdoor.
 8. Service Temperature: Minus 40 to plus 200 deg F.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
- C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
9. Service: Indoor or outdoor.
10. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.8 SEISMIC-RESTRAINT DEVICES

- A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of the ICC Evaluation Service, the Office of Statewide Health Planning and Development for the State of California, or an agency acceptable to authorities having jurisdiction.
 - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- B. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- C. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod.
- E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to

size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Provide duct liner on interior, rectangular supply and return air ducts where noted on plans. Liner shall be limited to the first 15 ft of rectangular supply and return ducts from fans. Duct sizes indicate clear airflow dimensions. Increase sheet metal sizes accordingly.
- D. Install round ducts in maximum practical lengths.
- E. Install ducts with fewest possible joints.
- F. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- G. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- I. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- J. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- K. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- L. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- M. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems", and ASCE/SEI 7.
 - 1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an evaluation service member of the ICC Evaluation Service, the Office of Statewide Health Planning and Development for the State of California, or an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. HVAC unit internal surfaces and components including coil section, condensate drain pans, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.

3.8 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel:
- B. Supply Ducts:
 - 1. Pressure Class: Positive 2-inch wg.
 - 2. Minimum SMACNA Seal Class: B for unconditioned space, C for conditioned space.
 - 3. SMACNA Leakage Class: 12.

C. Return Ducts:

1. Pressure Class: Positive or negative 2-inch wg.
2. Minimum SMACNA Seal Class: B for unconditioned space, C for conditioned space.
3. SMACNA Leakage Class: 12.

D. Exhaust Ducts:

1. Pressure Class: Negative 2-inch wg.
2. Minimum SMACNA Seal Class: C if negative pressure in unconditioned space, B if negative pressure in conditioned space, and A if positive pressure.
3. SMACNA Leakage Class for Rectangular: 12

E. Liner:

1. Supply Air Ducts: Fibrous glass, Type I, 1-1/2 inches thick.
2. Return Air Ducts: Fibrous glass, Type I, 1-1/2 inches thick.

F. Double-Wall Duct Interstitial Insulation:

1. Supply Air Ducts: 1 inch thick.
2. Install only in exposed area as specified in the drawings.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to Diameter Ratio: 1.5.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.

- b. Rectangular Main to Round Branch: Spin in.
- 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Fire dampers.
3. Turning vanes.
4. Flexible connectors.
5. Flexible ducts.
6. Duct accessory hardware.
7. Access Panels

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 1. Galvanized Coating Designation: G90.
 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance, Inc.
 - b. Arrow United Industries.
 - c. Cesco.
 - d. Greenheck.
 - e. Louver & Dampers, Inc.
 - f. Nailor Industries Inc.
 - g. Pottorff.
 - h. Ruskin Company.
 - i. Vent Products Co., Inc.
2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
6. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 FIRE DAMPERS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance, Inc.
 - b. Arrow United Industries.
 - c. Cesco.
 - d. Greenheck.
 - e. Louver & Dampers, Inc.
 - f. Nailor Industries Inc.
 - g. Pottorff.
 - h. Ruskin Company.
 - i. Vent Products Co., Inc.
- B. Type: Static; rated and labeled according to UL 555 by an NRTL.
- C. Fire Rating: 1-1/2 hours.
- D. Frame: Curtain type with blades inside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 1. Minimum Thickness: 0.138 inch thick, as indicated, and of length to suit application.
 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, in gauges required by UL Listing, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.
- H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- I. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.5 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Aero-Dyne Sound Control Co.
 2. Anemostat Products Div.; Dynamics Corp. of America.
 3. Ductmate Industries, Inc.
 4. Duro Dyne Inc.
 5. Register & Grill Mfg. Co., Inc.
 6. Sheet Metal Connectors, Inc.

- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall.

2.6 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. Elgen Manufacturing.
 - 4. Hardcast, Inc.
 - 5. JP Lamborn Co.
 - 6. Ventfabrics, Inc.
 - 7. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibration of connected equipment.

2.7 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. Thermaflex.
- B. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 deg F.
4. Insulation R-value: R-6.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
2. Non-Clamp Connectors: Liquid adhesive plus tape.

2.8 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.
- C. Manufacturer: Subject to compliance with requirements, provide duct hardware of one of the following:
 1. Ductmate, Ind.
 2. Ventfabrics, Inc.
 3. Young Regulator Co.

2.9 ACCESS PANELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Arrow United Industries.
 2. Bar-Co., Inc.
 3. J.L Industries.
 4. Karp Associates, Inc.
 5. Milcor Div. Inryco, Inc.
 6. Nystrom Building Products
 7. Wade
 8. Zurn
- B. Provide access doors for all concealed equipment, except where above lay-in ceilings. Refer to Section "Mechanical Identification" for labeling of access doors.
- C. Access doors shall be adequately sized for the devices served with a minimum size of 18" x 18", furnished by the respective Trade and installed by the Contractor.
- D. Access doors must be of the proper construction for type of construction where installed.
- E. The exact location of all access doors shall be verified with the Architect prior to installation.

- F. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel with welds ground smooth and flush with adjacent surfaces.
- G. Frames: 16-gauge steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile or wood paneling.
- H. For installation in masonry, concrete, ceramic tile, or wood paneling: 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors.
- I. For gypsum wallboard or plaster: perforated flanges with wallboard bead.
- J. For full-bed plaster applications: galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
- K. Flush Panel Doors: 14-gauge sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.
- L. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.
- M. Locking Devices: Flush, screwdriver-operated cam locks.
- N. Locking Devices: Where indicated on the drawings or where access panels are installed in locations accessible to the public, provide 5-pin or 5-disc type cylinder locks, individually keyed; provide 2 keys.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116".
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire dampers according to UL listing.
- H. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

- I. Install flexible connectors to connect ducts to equipment.
- J. Connect diffusers to ducts with maximum 5 ft lengths of flexible duct clamped.
- K. Connect flexible ducts to metal ducts with liquid adhesive plus tape and draw bands.
- L. Install duct test holes where required for testing and balancing purposes.
- M. Flexible ductwork shall have CPE liner with steel wire helix mechanically locked or permanently bonded to the liner.
- N. Flexible ductwork shall be installed straight as possible avoiding tight turns with a maximum of one 90 degree bend in any length.
- O. Flexible duct shall be provided in continuous lengths with no intermediate joints.
- P. Support flexible duct clear of the ceiling tile, light fixtures and air terminals. Support for maximum sag of 1/2-inch per foot.
- Q. Provide turning vanes, of same gauge as ductwork, rigidly fastened with guide strips in ductwork having an offset of 45 degrees or more. Vanes shall be provided in all supply and exhaust ductwork and in return and outside air ductwork that has an air velocity exceeding 1000 fpm.
- R. Set frames for access doors accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces. Adjust hardware and panels after installation for proper operation.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

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SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Centrifugal roof ventilators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 SPARE PARTS AND EXTRA MATERIALS

A. Furnish extra materials as specified in Section 017700.

B. Furnish spare parts described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.

1. Furnish one additional complete set of belts for each belt-driven fan.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation
2. Loren Cook Company
3. PennBarry.
4. AcmeFan
5. Twin City Fan Company.

- B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
 - 1. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt Drives:
 - 1. Resiliently mounted to housing.
 - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - 4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 - 5. Fan and motor isolated from exhaust airstream.
- E. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
 - 3. Bird Screens: Removable, 1/2-inch mesh, aluminum, or brass wire.
 - 4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
- F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
 - 1. Configuration: Built-in cant and mounting flange.
 - 2. Overall Height: 14" or as specified on drawings.
 - 3. Pitch Mounting: Manufacture curb for roof slope.
 - 4. Metal Liner: Galvanized steel.
- G. Capacities and Characteristics: As specified in drawings.

2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Equipment Mounting:
 - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.
- C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- D. Install units with clearances for service and maintenance.
- E. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."
- F. Restroom exhaust controlled by NexRev controller. Operate fan continuously during occupied hours and shut fan down during unoccupied hours.
- G. Riser room exhaust if required shall engage with fire pump operation.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor, and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 233423

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Refer to Section 002200 Supplementary Instructions to Bidders, Items Furnished by Owner and comply with all requirements including use of Forms A – Forms E.
- B. Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this Section.
- C. Types of outlets and inlets required for project include the following:
 - 1. Ceiling air diffusers.
 - 2. Wall registers and grilles.
 - 3. Drop box diffusers are owner furnished, contractor installed.
- D. Refer to section 233113 "Metal Ducts" and section 233300 "Air Duct Accessories"; not work of this Section.
- E. Refer to section 230593 "Testing, adjusting, and balancing for HVAC"; not work of this Section.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:
 - 1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.
 - 2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.
 - 3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature, and velocity traverses; throw and drop; and noise criteria ratings at specified airflows. Indicate selections on data.
 - 4. Maintenance Data: Submit maintenance data, including cleaning instructions for finishes, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

1.3 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish 3 operating keys for each type of air outlet and inlet that require them.

1.4 QUALITY ASSURANCE

A. Codes and Standards:

1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
3. ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 "Certification, Rating and Test Manual".
4. ADC Seal: Provide air outlets and inlets bearing ADC Certified Rating Seal.
5. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".
6. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
7. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

PART 2 - PRODUCTS

2.1 CEILING AIR DIFFUSERS

- A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and provided with accessories as required for a complete installation.
- B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling system and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.
- D. Types: Provide ceiling diffusers of type, capacity and with accessories and finishes as scheduled on the drawings.
- E. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Krueger Mfg Co.
 2. METALAIRE, Inc.
 3. Nailor Industries Inc.
 4. Price Industries.
 5. Titus Products Div.; Philips Industries, Inc.

2.2 REGISTERS AND GRILLES

- A. General: Except as otherwise indicated, provide manufacturer's standard registers and grilles where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and provided with accessories as required for a complete installation.
- B. Performance: Provide registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- C. Wall Compatibility: Provide registers and grilles with border styles that are compatible with adjacent wall systems and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction which will contain each type of wall register and grille.
- D. Types: Provide registers and grilles of type, capacity and with accessories and finishes as scheduled on the drawings.
- E. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Krueger Mfg Co.
 - 2. METALAIRE, Inc.
 - 3. Nailor Industries Inc.
 - 4. Price Industries.
 - 5. Titus Products Div.; Philips Industries, Inc.

2.3 DROP BOX DIFFUSERS

- A. General: Except as otherwise indicated, provide manufacturer's standard registers and grilles where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and provided with accessories as required for a complete installation.
- B. Performance: Provide drop box diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
- C. Construction: Drop box diffusers shall be minimum 22-gauge galvanized steel construction, factory assembled and welded, and provided with standard duct connections and mounting brackets for field installation. Diffusers shall have double deflection grilles or drum louvers that are individually adjustable to customize horizontal and vertical throws and factory installed air diverters or turning vanes. Direct pattern deflectors as shown on plans.
- D. Diffusers shall be insulated with 1-inch thick, 1.5 lb. duct liner installation.
- E. Diffusers shall be factory unpainted (galvanized).

- F. Manufacturers: Subject to compliance with requirements, provide dropbox diffusers by one of the following:
1. AES Industries
 2. Curbs Plus, Inc
 3. Ruskin

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which air outlets and inlets are to be installed for compliance with installation tolerances and conditions that would affect the performance of the equipment. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install air outlets and inlets in accordance with manufacturer's written instructions, design drawings, referenced standards, and in accordance with recognized industry practices to insure that products serve intended function.
- B. Coordinate with other work, including ductwork and duct accessories, to interface installation of air outlets and inlets with other work.
- C. Where a 90-degree elbow is required at the connection to air devices, provide a rigid duct elbow or, at Contractor's option, a flexible elbow assembly as specified in Division 23 section "Metal Ducts".
- D. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling module.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

- A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove dirt and smudges. Replace any air device that has damaged finishes.

PART 4 - SERVICE

4.1 SERVICE PROVIDED TO OWNER

- A. Vendor to have designated personnel able and ready to respond to Owner and Owner's Consultants questions in a timely manner.

1. Initial inquiry to be followed up on within 24 hours, excluding weekends and holidays. A solution or final answer is not required, but confirmation and/or response notifying Owner or Owner's Consultants of receipt of the question and an estimated time period for a response is needed.
 2. Response providing formal direction for a solution to the question is required within three (3) business days of the initial inquiry.
- B. Vendor to have designated personnel able and ready to respond to Contractor and Sub Contractors questions in a timely manner.
1. Initial inquiry to be followed up on within 24 hours, excluding weekends and holidays. A solution or final answer is not required, but confirmation and/or response notifying Owner or Owner's Consultants of receipt of the question and an estimated time period for a response is needed.
 2. Response providing formal direction for a solution to the question is required within three (3) business days of the initial inquiry.

END OF SECTION 233713

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SECTION 234100 - PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pleated panel filters.

1.2 SPARE PARTS AND EXTRA MATERIALS

A. Furnish extra materials as specified in Section 017700.

B. Furnish spare parts described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.

1. One complete spare set of filters of each type required for each air handling system.

C. In addition to the spare set of filters, install new filters at completion of air handling system work, and prior to testing, adjusting, and balancing work.

D. If HVAC equipment is used during the construction period, Contractor shall provide one set of filters when the unit is started and replace filters when needed, but not less than every month. On the day of substantial completion, the Contractor shall clean the unit and provide a new set of filters at each location in the unit.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance:

1. Comply with applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality"; Section 5 - "Systems and Equipment"; and Section 7 - "Construction and Startup."

B. Comply with NFPA 90A and NFPA 90B.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PLEATED PANEL FILTERS

A. Description: Factory-fabricated, self-supported, extended-surface, pleated, panel-type, disposable air filters with holding frames.

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

- a. 3M.
 - b. AAF International.
 - c. Camfil Farr.
 - d. Columbus Industries, Inc.
 - e. Koch Filter Corporation.
- B. Filter Unit Class: UL 900, Class 2.
- C. Media: Cotton and synthetic fibers coated with nonflammable adhesive.
 - 1. Media shall be coated with an antimicrobial agent.
 - 2. Separators shall be bonded to the media to maintain pleat configuration.
 - 3. Welded-wire grid shall be on downstream side to maintain pleat.
 - 4. Media shall be bonded to frame to prevent air bypass.
 - 5. Support members on upstream and downstream sides to maintain pleat spacing.
- D. Filter-Media Frame: Fiberboard casings with diagonal bracing bonded to the entering and exiting side of each pleat. Provide media support grid of welded wire construction coated with rust inhibitor.
- E. Mounting Frames: Welded galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.
- F. Capacities and Characteristics:
 - 1. Thickness or Depth: 2 inches.
 - 2. Maximum or Rated Face Velocity: 500 fpm.
 - 3. Efficiency: 90 percent on particles 20 micrometers and larger at 500 fpm.
 - 4. Arrestance: 90 percent when tested according to ASHRAE 52.2.
 - 5. Initial Resistance: 0.30-inch wg at 500 fpm.
 - 6. Recommended Final Resistance: 0.90-in wg.
 - 7. MERV Rating: 7 when tested according to ASHRAE 52.2.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Equipment Mounting:
 - 1. Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.
- C. Install filters in position to prevent passage of unfiltered air.
- D. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing with new, clean filters.
- E. Coordinate filter installations with duct and HVAC unit installations.

3.2 CLEANING

- A. After completing system installation and testing, adjusting, and balancing of air-handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION 234100

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**SECTION 237413 - PACKAGED, OUTDOOR, AIR-HANDLING UNITS
(FURNISHED BY OWNER)**

PART 1 - GENERAL

1.1 SUMMARY

- A. Refer to Section 002213 Supplementary Instructions to Bidders, Items Furnished by Owner and comply with all requirements including use of Forms A – Forms E.
- B. This Section includes packaged, outdoor, rooftop heating and cooling units.
- C. All rooftop heating and cooling units are owner furnished, contractor installed.

1.2 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Performance:
 - 1. Design Wind Load: As indicated on structural Drawings.
 - 2. Building Classification Category: As indicated on structural Drawings.
 - 3. Minimum 10 lb./sq. ft multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.
- B. Seismic Performance: RTUs shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, required clearances, weights, furnished specialties and accessories; and installation and start-up instructions.
- B. Operation and Maintenance Data: Submit maintenance data and parts list for each rooftop unit, including "trouble-shooting" maintenance guide, servicing guide and preventative maintenance schedule and procedures. Include this data in maintenance manual; in accordance with requirements of Division 1.

1.4 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish spare parts described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.
 - 1. One set of matched fan belts for each belt driven fan.
 - 2. One set of spare filters of each type required for each unit.

1.5 PROTECTION

- A. Protect rooftop heating and cooling units from damage. Damage incurred due to Contractor neglect will be repaired by manufacturer at Contractor's expense.
- B. Install new filters at completion of installation work, and prior to testing, adjusting, and balancing work.
- C. If HVAC equipment is used during construction, the Contractor shall provide one set of filters when the unit is started and replace filters when needed, but not less than every month. On the day of substantial completion, the Contractor shall clean the unit and provide a new set of filters.

1.6 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. Gas-fired furnace section construction shall be in accordance with AGA safety standards. Furnace section shall bear the AGA label.
 - 2. Testing and rating of rooftop units of 135,000 btu/hr. capacity or over shall be in accordance with ARI 360 "Standard for Commercial and Industrial Unitary Air-Conditioning Equipment".
 - 3. Testing and rating of rooftop units under 135,000 btu/hr. capacity shall be in accordance with ARI 210 "Standard for Unitary Air-Conditioning Equipment" and provide Certified Rating Seal. Sound testing and rating of units shall be in accordance with ARI 270 "Standard for Sound Rating of Outdoor Unitary Equipment". Units shall bear Certified Rating Seal.
 - 4. Refrigerating system construction of rooftop units shall be in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
 - 5. Energy Efficiency Ratio (EER) of rooftop units shall be equal to or greater than prescribed by ASHRAE 90.1-2007 "Energy Standard For Buildings Except Low-Rise Residential Buildings".
 - 6. Rooftop units shall be listed by UL and have UL label as a unit.
 - 7. Rooftop units shall be designed, manufactured, and tested in accordance with UL requirements.

1.7 WARRANTY

- A. Warranty on Compressor and Heat Exchanger: Provide written warranty agreeing to replace/repair with warranty period, compressors and heat exchangers with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly or failure to perform as required; providing manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only and does not include labor for removal and reinstallation.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Daikin
 - 2. Lennox
 - 3. Carrier

2.2 GENERAL

- A. General Description: Units shall be factory-assembled and tested, designed for roof or slab installation, and consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, filters, and dampers. Capacities and electrical characteristics shall be as scheduled on the Drawings.
- B. Casing: Provide manufacturer's standard casing construction, having corrosion protection coating, and exterior finish. Casings shall have removable panels or access doors for inspection and access to internal parts, a minimum of 1/2-inch thick, 1.0-pound density thermal insulation, knockouts for electrical and piping connections and an exterior condensate drain connection and lifting lugs.
- C. Roof Curbs: Provide manufacturer's standard construction. Construction shall be in accordance with NRCA Standards. Curb shall be sloped to match roof structure to enable the rooftop unit to be installed level.
 - 1. Overall Roof Curb Height: Minimum 14 inches or as scheduled on the drawings.
- D. Compressors: Provide serviceable, semi-hermetic, or fully hermetic compressors, complete with integral vibration isolators and crankcase heaters.
- E. Evaporator Fans: Provide forward-curved, centrifugal, belt-driven fans with adjustable sheaves or direct-driven fans; and permanently lubricated motor bearings.
- F. Condenser Fans: Provide propeller-type, direct-driven fans with permanently lubricated bearings.
- G. Coils:
 - 1. General: Aluminum plate fin and seamless copper tube type. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall have a galvanized steel casing. Coils shall be mounted in the coil casing with same end connections accessible for service. Coils shall be removable from the unit through the roof or through the piping enclosure. Coil section shall be completely insulated.
 - 2. Refrigerant cooling coils: Refrigerant coils shall have an equalizing type vertical distributor to ensure each coil circuit receives the same amount of refrigerant.

- Coils shall be proof (450 psig) and leak (300 psig) tested with air pressure under water, then cleaned, dehydrated, and sealed with a holding charge of refrigerant.
3. Hot Gas Reheat Coil: Provide hot gas reheat coil with staged or modulating control for reheat during dehumidification operation. Hot gas reheat coil shall maintain space temperature when unit is operating in the dehumidification mode. Refer to sequence of operations.
- H. Condensate Drain Pan: Provide galvanized or stainless-steel condensate drain pan sloped to drain connection.
- I. Heat Exchangers: Provide manufacturer's standard construction for gas-fired heat exchangers and burners. Minimum efficiency for heat exchangers shall be 80 percent.
1. Controls: Provide the following controls for the gas-fired heat exchangers:
 - a. Redundant gas valve;
 - b. Intermittent pilot ignition;
 - c. Electronic spark ignition system;
 - d. High limit cutout;
 - e. Forced draft proving switch.
- J. Filters Section: Provide 2-inch-thick fiberglass throwaway pleated filters in filter rack, with maximum face velocity of 400 fpm and minimum MERV rating per ASHRAE 52.2 of MERV 7. Filters shall be non-combustible per FM Global requirements.
- K. Outdoor Air Damper: Provide outside air damper constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 cfm of leakage per square foot when subjected to 2-inch wg air pressure differential across the damper. Refer to schedules on the drawings for capacity and control method for the outdoor air damper of each unit.
- L. Economizer Control: Provide economizer system consisting of return and outside air dampers, fully modulating electric control system with dry bulb or economizer control as scheduled on the drawings, and adjustable mixed-air thermostat. System shall have 100 percent outside air capability. Provide automatic changeover through adjustable control device.
- M. Safety Controls: Provide manual reset type safety controls for:
1. Low pressure cutout;
 2. High pressure cutout;
 3. Compressor motor overload protection.
- N. Unit Controls: Solid-state control board and components contain at least the following features:
1. Indoor fan on/off delay.
 2. Default control to ensure proper operation after power interruption.
 3. Service relay output.
 4. Unit diagnostics and diagnostic code storage.

5. Field-adjustable control parameters.
 6. Dehumidification control.
 7. Economizer control.
 8. Gas valve delay between first-and second-stage firing.
 9. Minimum run time.
 10. Indoor-air quality control with carbon dioxide control.
 11. Fan-proving switch to lock out unit if fan fails.
 12. Dirty-filter switch.
- O. Electrical: Provide a 125 VAC, 20 amp duplex convenience receptacle mounted to unit ready for field wiring through the curb with a cover UL listed for wet and damp locations when in use. Unit power connection shall be either through unit cabinet or within roof curb perimeter. Rooftop units shall be designed to meet a minimum short-circuit withstand rating of 10,000 kA or as scheduled on the drawings.
- P. Refrigerant Type: Provide rooftop units designed to operate with R-410 refrigerant.
- Q. Accessories: Units shall include the following accessories as indicated or scheduled:
1. Low ambient control: Head pressure control, designed to operate at temperatures down to 0 deg F (-18 deg C).
 2. Provide guards as scheduled on contract drawings to protect the condenser coil from hail or other damage.
 3. Thermostat: Assembly shall provide for staged heating and cooling with manual or automatic changeover on standard subbase.
 4. Enthalpy economizer with powered exhaust relief.
 5. Novar RTU IMC Compatible with NOVAR LSE system.
 6. Novar-provided temperature, humidity and carbon dioxide sensors.
- R. Wind and Seismic Restraints: Metal brackets compatible with the curb and casing, painted to match RTU, used to anchor unit to the curb, and designed for loads at Project site. Comply with requirements in Section 230550 "Vibration and Seismic Controls for HVAC" for wind-load requirements

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas are conditions under which rooftop units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION

- A. General: Install rooftop units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated and maintain manufacturer's recommended clearances.
- B. Support: Support rooftop units on roof curb.

- C. Electrical Wiring: Install electrical devices furnished by manufacturers but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical installer.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.
- D. Ductwork: Refer to Division-23 section "Metal Ducts". Connect supply and return ducts to units with flexible duct connections. Provide transitions to exactly match unit duct connection size.
- E. Piping: Piping installation requirements are specified in other Division 23 sections. The Drawings indicate the general arrangement of piping, valves, fittings, and specialties. The following are specific connection requirements:
 - 1. Condensate Drain Piping: Route condensates drain to nearest roof drain or to location shown on the drawings. Provide traps according to drawings and install cleanouts at changes in direction (refer to manufacturer's recommendations for any additional requirements).

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Adjust seals and purge. Adjust damper linkages for proper damper operation.
 - 3. Clean the entire unit including cabinet interiors just prior to substantial completion to remove foreign material and construction dirt and dust. Vacuum clean fan wheel, fan cabinet, intake plenum cabinet, heat exchange surfaces, cooling/heating coil sections, filter sections, access sections, etc.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 5. Set initial temperature and humidity set points.
 - 6. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- B. Remove malfunctioning units, replace with new units and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

3.5 TRAINING

- A. General: At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's

designated personnel for a minimum of two hours on the operation and maintenance of the equipment provided under this section.

B. Content: Training shall include but not be limited to:

1. Overview of the system and/or equipment as it relates to the facility as a whole.
2. Operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention.
3. Review data included in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."

C. Certification: Vendor shall submit to the Owner a certification letter stating that the Owner's designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The certification letter shall be signed by the Contractor and the Owner's representative indicating agreement that the training has been provided.

D. Schedule: Schedule training with Owner with at least 7 days' advance notice.

3.6 CLEANING AND ADJUSTING

- A. Adjust fan for required airflow in accordance with Section "Testing, Adjusting and Balancing for HVAC." Tighten belts as required for proper operation.
- B. Adjust damper linkages for proper damper operation.
- C. Clean the entire unit including cabinet interiors just prior to substantial completion to remove foreign material and construction dirt and dust. Vacuum clean fan wheel, fan cabinet, intake plenum cabinet, heat exchange surfaces, cooling/heating coil sections, filter sections, access sections, etc.

3.7 STARTUP

- A. Final Checks Before Start-Up: Perform the following operations and checks before start-up:
 1. Remove shipping, blocking, and bracing.
 2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
 3. Perform cleaning and adjusting specified in this Section.
 4. Disconnect fan drive from motor and verify proper motor rotation direction and verify fan wheel free rotation and smooth bearings operations. Reconnect fan drive system, align belts, and install belt guards.
 5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
 6. Set outside-air and return-air mixing dampers to minimum outside-air setting.
 7. Comb coil fins for parallel orientation.
 8. Install clean filters. Do not operate air handling unit without pre-filters installed.

9. Verify manual and automatic volume control, and fire and smoke dampers in connected ductwork systems are in the full-open position.
 10. Disable automatic temperature control operators.
- B. Start-Up Services: Provide the services of a factory-authorized service representative to start-up rooftop units in accordance with manufacturer's written start-up instructions. Do not operate units without filters installed. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
1. Energize motor, verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
 - a. Replace fan and motor pulleys as required to achieve design conditions.
 - b. Measure and record motor electrical values for voltage and amperage.
 - c. Shut unit down and reconnect automatic temperature control operators.

PART 4 - REFER TO DIVISION 23 SECTION "TESTING, ADJUSTING AND BALANCING FOR HVAC" FOR PROCEDURES FOR SYSTEM TESTING ADJUSTING AND BALANCING SERVICE

4.1 SERVICE PROVIDED TO OWNER

- A. Vendor to have designated personnel able and ready to respond to Owner and Owner's Consultants questions in a timely manner.
1. Initial inquiry to be followed up on within 24 hours, excluding weekends and holidays. A solution or final answer is not required, but confirmation and/or response notifying Owner or Owner's Consultants of receipt of the question and an estimated time period for a response is needed.
 2. Response providing formal direction for a solution to the question is required within three (3) business days of the initial inquiry.
- B. Vendor to have designated personnel able and ready to respond to Contractor and Sub Contractors questions in a timely manner.
1. Initial inquiry to be followed up on within 24 hours, excluding weekends and holidays. A solution or final answer is not required, but confirmation and/or response notifying Owner or Owner's Consultants of receipt of the question and an estimated time period for a response is needed.
 2. Response providing formal direction for a solution to the question is required within three (3) business days of the initial inquiry.

END OF SECTION 237413

SECTION 238239 – WALL-MOUNTED UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Modine HER series.
 - 2. Q Mark MUH series.
 - 3. Reznor UH series.

2.2 DESCRIPTION

- A. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 CABINET

- A. Finish: Baked enamel over baked-on primer with manufacturer's standard color, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
- B. Surface-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

2.4 COIL

- A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection.

2.5 FAN AND MOTOR

- A. Fan: Aluminum propeller directly connected to motor.
- B. Motor: Permanently lubricated. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.6 CONTROLS

- A. Controls: Wall-mounted thermostat.
- B. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

2.7 CAPACITIES AND CHARACTERISTICS

- A. Performance as specified in drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wall and ceiling unit heaters to comply with NFPA 90A.
- B. Install wall and ceiling unit heaters level and plumb.
- C. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

END OF SECTION 238239

SECTION 239100 – TESTING REQUIREMENTS AND COMPLETION FORM

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORMED AND PASSED
230548.3.3	A. Testing Agency: Engage a qualified testing agency to perform tests and inspections. B. Perform tests and inspections. C. Tests and Inspections: 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction. 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice. 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members. 4. Test to 90 percent of rated proof load of device. 5. Measure isolator restraint clearance. 6. Measure isolator deflection. 7. Verify snubber minimum clearances. D. Remove and replace malfunctioning units and retest as specified above. E. Prepare test and inspection reports.	Vibration Isolation Vendor	
230593.1.1.A.1	General Contractor shall coordinate with NexRev to perform the Test & Balance and submit the Test & Balance reports to the Owner and AOR.	Mechanical Contractor	
230593.1.4.A	TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician	Mechanical Contractor	
230593.2.3.A	Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.	Mechanical Contractor	
230593.2.7.A	General: Prepare a certified written report; tabulate and divide the report into separate	Mechanical Contractor	

	sections for tested systems and balanced systems. 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer. 2. Include a list of instruments used for procedures, along with proof of calibration. 3. Certify validity and accuracy of field data. 4. Provide the Test & Balance report to owner and AOR.		
230593.2.8.B	If required by code commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.	Mechanical Contractor	
231123.3.11	Field Quality Control A. Perform tests and inspections. B. Tests and Inspections: 1. Test, inspect, and purge natural gas according to NFPA 54, the International Fuel Gas Code, and authorities having jurisdiction. C. Natural-gas piping will be considered defective if it does not pass tests and inspections. D. Prepare test and inspection reports.	Mechanical Contractor	
233300.3.2.A	Tests and Inspections: 1. Operate dampers to verify full range of movement. 2. Inspect locations of access doors and verify that purpose of access door can be performed. 3. Operate dampers to verify full range of movement and verify that proper heat-response device is installed. 4. Inspect turning vanes for proper and secure installation.	Mechanical Contractor	
233423.3.3.B	Tests and Inspections: 1. Verify that shipping, blocking, and bracing are removed. 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches. 3. Verify that cleaning and adjusting are complete. 4. Disconnect fan drive from motor, verify	Mechanical Contractor	

	proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards. 5. Adjust belt tension. 6. Adjust damper linkages for proper damper operation. 7. Verify lubrication for bearings and other moving parts. 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position. 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage. 10. Shut unit down and reconnect automatic temperature-control operators. 11. Remove and replace malfunctioning units and retest as specified above.		
233423.3.3.C	Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.	Mechanical Contractor	
233423.3.3.D	Prepare test and inspection reports.	Mechanical Contractor	
233713.1.2.A.1	ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".	Mechanical Contractor	
233713.1.2.A.2	ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".	Mechanical Contractor	
233713.1.2.A.3	ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 "Certification, Rating and Test Manual".	Mechanical Contractor	
233713.1.2.A.5	AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".	Mechanical Contractor	
237413.3.3.A	Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing. 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. 2. Adjust seals and purge. Adjust damper	Mechanical Contractor	

	linkages for proper damper operation. 3. Clean the entire unit including cabinet interiors just prior to substantial completion to remove foreign material and construction dirt and dust. Vacuum clean fan wheel, fan cabinet, intake plenum cabinet, heat exchange surfaces, cooling/heating coil sections, filter sections, access sections, etc. 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. 5. Set initial temperature and humidity set points. 6. Set field-adjustable switches and circuit-breaker trip ranges as indicated.		
238239.3.2.A	Wall-Mounted Unit Heater Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.	Mechanical Contractor	

END OF SECTION 239100

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SECTION 239200 – O&M REQUIREMENTS AND COMPLETION FORM

REFER TO SECTION #	O & M REQUIRED INFORMATION	DATE O & M MANUALS DELIVERED/TAS K COMPLETED
230010.1.10.B	Submit manuals prior to requesting the final punch list	
230010.1.10.C	Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division	
230010.1.10.D	At the completion of the project furnish to the Architect for the Owner, four (4) copies of brochures in three-ring, loose-leaf, hard-back notebook form, divided and tabbed, containing equipment data, approved shop drawings, diagrams, capacities, spare part numbers, manufacturer's service and maintenance data, warranties, guarantees, etc. Include local contacts complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications	
231123.1.6.A	Submit closeout operation and maintenance data for facility natural-gas piping.	
233300.1.3.A	Submit closeout operation and maintenance data for air duct accessories.	
233423.1.3.A	Submit closeout operation and maintenance data for HVAC power ventilators.	
237413.1.3.B	Operation and Maintenance Data: Submit maintenance data and parts list for each rooftop unit, including "troubleshooting" maintenance guide, servicing guide and preventative maintenance schedule and procedures. Include this data in maintenance manual; in accordance with requirements of Division 1.	
238239.1.3.A	Submit closeout operation and maintenance data for wall-mounted unit heaters.	

END OF SECTION 239200

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SECTION 260010 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section and to all following sections within Division 26. Refer to Section 002200 Supplementary Instructions to Bidders, Items Furnished by Owner and comply with all requirements including use of Forms A – Forms E.

1.2 SUMMARY

- A. This Division requires providing complete functioning systems, and each element thereof, as specified, indicated, or reasonably inferred, on the Drawings and in these Specifications, including every article, device, or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include, but are not limited to, materials, labor, supervision, supplies, tools, equipment, transportation, and utilities.
- B. Division 26 of these Specifications, and Drawings numbered with prefixes E, generally describe these systems, but the scope of the electrical Work includes all such Work indicated in all of the Contract Documents, including, but not limited to: Instructions to Bidders; Proposal Form; General Conditions; Supplementary General Conditions; Architectural, Structural, Mechanical, Plumbing and Electrical Drawings and Specifications; and Addenda.
- C. Drawings are graphic representations of the Work upon which the Contract is based. They show the materials and their relationship to one another, including sizes, shapes, locations, and connections. They also convey the scope of Work, indicating the intended general arrangement of the equipment, fixtures, outlets, and circuits without showing all of the exact details as to elevations, offsets, control lines, and other installation requirements. Use the Drawings as a guide when laying out the Work and to verify that materials and equipment will fit into the designated spaces, and which, when installed per manufacturers' requirements, will ensure a complete, coordinated, satisfactory and properly operating system.
- D. Specifications define the qualitative requirements for products, materials, and workmanship upon which the Contract is based.

1.3 QUALITY ASSURANCE

- A. Execute all Work under this Division in a thorough and professional manner by competent and experienced workmen duly trained to perform the Work specified.

- B. Install all Work in strict conformance with all manufacturers' requirements and recommendations, unless these Documents exceed those requirements. Install all equipment and materials in a neat and professional manner, aligned, leveled, and adjusted for satisfactory operation, in accordance with NECA guidelines.
- C. Unless indicated otherwise on the Drawings, provide all material and equipment new, of the best quality and design, free from defects and imperfections and with markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size and capacity. Provide all material and equipment of the same type from the same manufacturer whenever practicable.
- D. Unless specified otherwise, manufactured items of the same types specified within this Division shall have been installed and used, without modification, renovation, or repair for not less than one year prior to date of bidding for this Project.

1.4 CODES, REFERENCES AND STANDARDS

- A. Execute all Work in accordance with, and comply at a minimum with, National Fire Protection Association (NFPA) codes, state and local building codes, and all other applicable codes and ordinances in force, governing the particular class of Work involved, for performance, workmanship, equipment, and materials. Additionally, comply with rules and regulations of public utilities and municipal departments affected by connection of services. Where conflicts between various codes, ordinances, rules, and regulations exist, comply with the most stringent. Wherever requirements of these Specifications, Drawings, or both, exceed those of the above items, the requirements of these Specifications, Drawings, or both, shall govern. Code compliance, at a minimum, is mandatory. Construe nothing in these Construction Documents as permitting work not in compliance, at a minimum, with these codes. Bring all conflicts observed between codes, ordinances, rules, regulations and these documents to the Architect's and Engineer's attention in sufficient time, prior to the opening of Bids, to prepare the Supplementary Drawings and Specifications Addenda required to resolve the conflict.
- B. If the conflict is not reported timely, prior to the opening of bids, resolve the conflict and provide the installation in accordance with the governing codes and to the satisfaction of the Architect and Engineer, without additional compensation. Contractor will be held responsible for any violation of the law.
- C. Obtain timely inspections by the constituted authorities having jurisdiction; and, upon final completion of the Work, obtain and deliver to the Owner executed final certificates of acceptance from these authorities having jurisdiction.
- D. All material, manufacturing methods, handling, dimensions, methods of installation and test procedures shall conform to industry standards, acts, and codes, including, but not limited to the following, except where these Drawings and Specifications exceed them:

IBC	International Building Code
ADA	Americans with Disabilities Act
AEIC	Association of Edison Illuminating Companies
ANSI	American National Standards Institute

ASTM	American Society of Testing Materials
AWS	American Welding Society
AWWA	American Water Works Association
CSA/USA	Canadian Standards Association/USA
ICEA	Insulated Conductors Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code, NFPA 70
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers' Association
NETA	InterNational Electrical Testing Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Act
UL	Underwriter's Laboratories

- E. Comply with rules and regulations of public utilities and municipal departments affected by connections of services.
- F. Perform all electrical work in compliance with applicable safety regulations, including OSHA regulations. All safety lights, guards, and warning signs required for the performance of the electrical work shall be provided by the Contractor.
- G. Obtain and pay for all permits, licenses and fees that are required by the governing authorities for the performance of the electrical work.

1.5 DEFININITIONS

- A. Whenever used in these Specifications or Drawings, the following terms shall have the indicated meanings:
 - 1. Furnish: "To supply and deliver to the project site, ready for unloading, unpacking, assembling, installing, and similar operations."
 - 2. Install: "To perform all operations at the project site, including, but not limited to, and as required: unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, testing, commissioning, starting up and similar operations, complete, and ready for the intended use."
 - 3. Provide: "To furnish and install complete, and ready for the intended use."
 - 4. Furnished by Owner (or Owner-Furnished) or Furnished by Others: "An item furnished by the Owner or under other Divisions or Contracts and installed under the requirements of this Division by the job Contractor, complete, and ready for the intended use, including all items and services incidental to the Work necessary for proper installation and operation. Include the installation under the warranty required by this Division."
 - 5. Engineer: Where referenced in this Division, "Engineer" is the Engineer of Record and the Design Professional for the Work under this Division, and is a Consultant to, and an authorized representative of, the Architect, as defined in the General

and/or Supplementary Conditions. When used in this Division, it means increased involvement by, and obligations to, the Engineer, in addition to involvement by, and obligations to, the "Architect".

6. AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the Work.
7. NRTL: Nationally Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA, etc.), and acceptable to the Authority having Jurisdiction (AHJ) over this project. Nationally Recognized Testing Laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ, and standards that meet the specified criteria.

B. The terms "approved equal," "equivalent" or "equal" are used synonymously and shall mean "accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified". The term "approved" shall mean labeled, listed or both, by an NRTL and acceptable to the AHJ over this project.

C. The following definitions apply to excavation operations:

1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.
2. Subbase: as used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.
3. Subgrade: as used in this Section refers to the compacted soil immediately below the slab or pavement system.
4. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Architect.

1.6 COORDINATION

- A. Coordinate with other Divisions for electrical work included in them but not listed in Division 26 or indicated on electrical Drawings.
- B. Visit the site and ascertain the conditions to be encountered in installing the Work under this Division, verify all dimensions and locations before purchasing equipment or commencing work, and make due provisions for same in the bid. Failure to comply with this requirement shall not be considered justification for omission, alteration, and incorrect or faulty installation of any of the Work under this Division or for additional compensation for any Work covered by this Division.
- C. Refer to Drawings and Divisions of the other trades and to relevant equipment drawings and shop drawings to determine the extent of clear spaces. Make all offsets required to clear equipment, beams, and other structural members, and to facilitate concealing conduit in the manner anticipated in the design.
- D. Provide materials with trim that will fit properly the types of ceiling, wall, or floor finishes actually installed.

1.7 MEASUREMENTS AND LAYOUTS

- A. The Drawings are schematic in nature but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the Work. Figured dimensions take precedence to scaled dimensions. Determine exact locations by job measurements, by checking the requirements of other trades, and by reviewing all Contract Documents. Correct, at no additional costs to the Owner, errors that could have been avoided by proper checking and inspection.

1.8 SUBMITTALS

- A. Refer to Division 01 and General Conditions for submittal requirements.
- B. Assemble and submit for review, manufacturers product literature for material and equipment to be furnished, installed, or both, under this Division, including shop drawings, manufacturers' product data and performance sheets, samples, and other submittals required by this Division. Comply with submittal requirements as stated in Section 013300 SUBMITTAL PROCEDURES.
- C. Provide submittals in sufficient detail so as to demonstrate compliance with these Contract Documents and the design concept. Highlight, mark, list or indicate the materials, performance criteria and accessories that are being proposed.
- D. Refer to individual Sections for additional submittal requirements.
- E. Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus to/from mailing time via the Architect, plus a duplication of this time for resubmittals, if required. Transmit submittals as soon as possible after Notice to Proceed and before construction starts.
- F. Before transmitting submittals and material lists, verify that the equipment submitted is mutually compatible with and suitable for the intended use. Verify that the equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- G. Submittals shall contain the following information. Submittals not so identified will be returned to the Vendor without action:
 - 1. The project name.
 - 2. The applicable Specification Section and paragraph.
 - 3. The submittal date.
 - 4. The Contractor's stamp, which shall certify that the stamped drawings have been checked by the Contractor, comply with the Drawings and Specifications, and have been coordinated with other trades.
- H. The Engineer's checking and subsequent acceptance of such submittals shall not relieve the Vendor from responsibility for deviations from Drawings or Specifications unless Vendor has, in writing, called the Engineer's and Architect's attention to such deviations

at the time of submission, and secured written acceptance; nor shall it relieve Vendor from responsibility for errors in dimensions, details, sizes of members, or quantities; or for omissions of components or fittings; or for not coordinating items with actual building conditions and adjacent work.

1.9 ELECTRONIC DRAWING FILES

- A. In preparation of shop drawings or record drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DXF format from the Engineer. Contact the Architect for Architect's written authorization. In addition to payment, Architect's written authorization and data licensing agreement form must be received before electronic drawing files will be sent.
1. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 2. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
 3. Unless otherwise specified in writing, a check made payable to CASCO Diversified Corporation. For a shipping and handling fee of \$200 for a drawing set up to 12 sheets and \$15 per sheet for each additional sheet shall accompany the request for files.
 4. Contractor shall indicate the desired shipping method and drawing format with the request.

1.10 SUBSTITUTIONS

- A. Refer to Bid Documents, General and Supplementary Conditions and Division 01 Specification Sections for limitations and restrictions on substitutions.
- B. Materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution.
- C. No substitutions will be considered with receipt of Bids unless the Architect and Engineer have received from the Vendor a written request for approval to bid a substitution at least ten calendar days prior to the date for receipt of Bids and have approved the substitution request. Include, with each such request, the name of the material or equipment for which substitution is being requested, and a complete description of the proposed substitution, including drawings, cut sheets, performance and test data, and all other information necessary for an evaluation. Include also a statement setting forth changes in other materials, equipment or other work that would be required to incorporate the substitution. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's or Engineer's decision to approve or disapprove a substitution in a Bid is final.
- D. If the proposed substitution is approved prior to receipt of Bids, such approval will be stated in an Addendum. Bidders shall not rely upon approvals made in any other manner, including verbal.

- E. No substitutions will be considered after receipt of Bids and before award of the Contract.
- F. No substitutions will be considered after the Contract is awarded unless specifically provided in the Contract Documents.

1.11 OPERATION AND MAINTENANCE DATA

- A. Refer to Division 01 and General Conditions for Operation and Maintenance Data.
- B. Submit data prior to requesting the final punch list and before all requests for Substantial Completion.
- C. Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division.
- D. Prior to Substantial Completion of the project, furnish to the Architect, for Engineer's review, and for the Owner's use, four (4) copies of brochures in three-ring, loose-leaf, hard-back notebook form, divided and tabbed, containing equipment data, approved submittals, shop drawings, diagrams, capacities, spare part numbers, manufacturer's service and maintenance data, warranties, guarantees, etc. Include local contacts complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications.

1.12 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish spare parts and extra materials specified in the individual sections of this Division and as specified in Section 017700.

1.13 RECORD DRAWINGS

- A. Keep a set of jobsite work prints of the Issued for Construction Drawings on the jobsite during construction, for the purpose of annotating changes. During the course of construction, indicate on these Documents, changes made from the Conformed Contract Documents. Pay particular attention to those items that require locating for servicing.
- B. At the completion of the project, incorporate changes noted on the jobsite work prints onto a complete set of Drawings to serve as Record Drawings. Mark each sheet "Record Drawing", along with the date, and deliver these Record Drawings to the Architect as outlined in Drawings in Division 01, Section "Project Record Documents".

1.14 DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 01 and General Conditions for Delivery, Storage and Handling.
- B. Deliver equipment and material to the job site in their original containers with labels intact, fully identified with manufacturer's name, make, model, model number, type, size, capacity and Underwriter's Laboratories, Inc. labels and other pertinent information necessary to identify the item.

- C. Deliver, receive, handle and store equipment and materials at the job site in the designated area and in such a manner as to prevent equipment and materials from damage and loss. Store equipment and materials delivered to the site on pallets and cover with waterproof, tear resistant tarp or plastic or as required to keep equipment and materials dry. Follow manufacturer's recommendations, and at all times, take every precaution to properly protect equipment and material from damage, including the erection of temporary shelters to adequately protect equipment and material stored at the Site. Equipment and/or material which becomes rusted or damaged shall be replaced or restored by the Contractor to a condition acceptable to the Architect and Engineer.
- D. Be responsible for the safe storage of tools, materials, and equipment.

1.15 WARRANTIES

- A. Refer to Division 01 and General Conditions for Warranties.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- C. Warrant each system and each element thereof against all defects due to faulty workmanship, design or material for a period of 12 months from date of Substantial Completion, unless specific items are noted to carry a longer warranty in these Construction Documents or manufacturer's standard warranty exceeds 12 months. Remedy all defects, occurring within the warranty period(s), as stated in the General Conditions and Division 01
- D. Also warrant the following additional items:
 - 1. All raceways are free from obstructions, holes, crushing, or breaks or any nature.
 - 2. All raceway seals are effective.
 - 3. The entire electrical system is free from all short circuits and unwanted open circuits and grounds.
- E. The above warranties shall include labor and material. Make repairs or replacements without any additional costs to the Owner.
- F. Perform the remedial work promptly, upon written notice from the Architect or Owner.
- G. At the time of Substantial Completion, deliver to the Owner all warranties, in writing and properly executed, including term limits for warranties extending beyond the one-year period, each warranty instrument being addressed to the Owner and stating the commencement date and term.

1.16 TEMPORARY FACILITIES

- A. Refer to Division 01 and General Conditions for Temporary Facilities requirements.
- B. Temporary Utilities: The types of services required include, but are not limited to, electricity, telephone, and internet. When connecting to existing franchised utilities for

required services, comply with service companies' recommendations on materials and methods, or engage service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations.

C. Construction Facilities: Provide facilities reasonably required to perform construction operations properly and adequately.

- 1 Enclosures: When temporary enclosures are required to ensure adequate workmanship, weather protection and ambient conditions required for the work, provide fire-retardant treated lumber and plywood; provide tarpaulins with UL label and flame spread of 15 or less; provide translucent type (nylon reinforced polyethylene) where daylighting of enclosed space would be beneficial for workmanship, and reduce use of temporary lighting.
- 2 Heating: Provide heat, as necessary, to protect work, materials and equipment from damage due to dampness and cold. In areas where building is occupied, maintain a temperature not less than 65 degrees F. Use steam, hot water, or gas from piped distribution system where available. Where steam, hot water or piped gas are not available, heat with self-contained LP gas or fuel oil heaters, bearing UL, FM or other approval labels appropriate for application. Vent fuel-burning heaters and equip units with individual-space thermostatic controls. Use electric-resistance space heaters only where no other, more energy-efficient, type of heater is available and allowable.

D. Conditions Affecting Excavations: The following project conditions apply:

1. Maintain and protect existing building services that transit the area affected by selective demolition.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations.

E. Site Information: Subsurface conditions were investigated during the design of the Project. Reports of these investigations are available for information only; data in the reports are not intended as representations or warranties of accuracy or continuity of conditions. The Owner will not be responsible for interpretations or conclusions drawn from this information.

F. Use of explosives is not permitted.

G. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits specified by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PERMITS

- A. Secure and pay for all permits required in connection with the installation of the Electrical Work. Arrange with the various utility companies for the installation and connection of all required utilities for this facility and pay all charges associated therewith including connection charges and inspection fees, except where these services or fees are designated to be provided by others.

3.2 TEMPORARY ELECTRICAL SERVICE AND WIRING

- A. Provide 208Y/120 volt, three-phase, four-wire, temporary electrical service, and temporary lighting system to facilitate construction.
- B. Pay all charges made by the Electric Utility, with respect to installation and energy charges for temporary services through turn-over to Academy Sports & Outdoors Merchandising.
- C. Work for the temporary power shall consist of all labor and materials, including, but not limited to conduit, wiring, panelboards, fuse blocks, fused disconnecting switches, fuses, pigtails, receptacles, wood panel switch supports, and other miscellaneous materials required to complete the power system.
- D. Install all temporary wiring in accordance with applicable codes and maintain in an OSHA-approved manner.
- E. Provide an adequate number of GFCI type power distribution centers, rated 208Y/120V, four-wire, and not less than 60A, with sufficient fuse blocks or breakers for lighting and hand tool circuits, 60A four-wire feeders, all mounted within prefabricated enclosures UL listed for this application or on suitable wood panels bolted to columns or upright wood supports as required.
- F. Install circuits to points on each level of each building so that service outlets can be reached by a 50-foot extension cord for 120V power and a 100-foot extension cord for 208V power (or as required by OSHA or local authorities).
- G. Provide one lighting outlet per 30 linear feet of corridor and at least one light in each room and for every 800 square feet of floor area. Temporary lighting shall comply with OSHA requirements.
- H. If additional service is required for cranes, electrical welders or for electric motors over 1/2 HP per unit, such additional service shall become the responsibility of the trade involved.
- I. When the permanent wiring for lighting and power is installed, with approval of the Architect and Owner, the permanent system may be used, provided the Contractor assumes full responsibility for all electrical material, equipment, and devices contained in the systems and provided that roof drainage system and roofing are complete.

- J. Before substantial completion or when directed by the Architect/Owner, remove all temporary services, lighting, wiring and devices from the property.

3.3 EXCAVATION AND BACKFILLING

- A. Refer to Division 01, Division 02 and General Conditions for Excavation and Backfilling.
- B. Perform excavation of every description, of whatever substance encountered and to the depth required in connection with the installation of the work under this Division. Excavation shall be in conformance with applicable Divisions and sections of the Specifications.
- C. Restore roads, alleys, streets, and sidewalks damaged during this Work to the satisfaction of Authorities Having Jurisdiction
- D. Do not excavate trenches close to walks or columns without prior consultation with the Architect.
- E. Erect barricades around excavations, for safety, and place an adequate number of amber lights on or near the work and keep them burning from dusk to dawn. Be responsible for all damage that any parties may sustain in consequence of neglecting the necessary precautions in prosecuting the work.
- F. Slope sides of excavations to comply with local, state, and federal codes and ordinances. Shore and brace as required for stability of excavation.
- G. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local, state and federal codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.
 - 1. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.
- H. Install sediment and erosion control measures in accordance with local codes and ordinances.
- I. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
 - 1. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.
 - 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches. In no case shall sewers be used as drains for such water.
- J. Trenching: Excavate trenches for electrical installations as follows:

1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of six to nine inches clearance on both sides of raceway and cables.
 2. Excavate trenches to depth indicated or required for raceway and cables to establish slope, away from buildings and indicated elevations. Beyond building perimeter, excavate trenches to an elevation below frost line.
 3. Limit the length of open trench to that in which raceway and cables can be installed, tested, and the trench backfilled within the same day.
 4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceway and cables. Provide a minimum of six inches of stone or gravel cushion between rock bearing surface and raceway and cables.
 5. Excavate trenches for raceway and cables and equipment with bottoms of trench to accurate elevations for support of raceway and cables on undisturbed soil.
- K. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.
- L. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.
1. Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.
 2. Under building slabs, use drainage fill materials.
 3. Under raceway and cables, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
 4. For raceway and cables less than 30 inches below surface of roadways, provide 4-inch-thick concrete base slab support. After installation and testing of raceway and cables, provide a 4-inch-thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.
 5. Other areas use excavated or borrowed materials.
- M. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Inspection, testing, approval, and locations of underground utilities have been recorded.
 2. Removal of concrete formwork.
 3. Removal of shoring and bracing, and backfilling of voids.
 4. Removal of trash and debris.
- N. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- O. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content.

- P. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
- Q. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below:
1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
 - a. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
 - b. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
 - c. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.
 2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.
- R. Subsidence: Where subsidence occurs at mechanical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.4 ACCESS TO EQUIPMENT

- A. Locate all pull boxes, junction boxes and controls so as to provide easy access for operation, service inspection and maintenance. Provide an access door where equipment or devices are located above inaccessible ceilings. Refer to Division 26 Section "Common Work Results for Electrical".
- B. Maintain all code required clearances and clearances required by manufacturers.

3.5 PENETRATIONS

- A. Unless otherwise noted as being provided under other Divisions, provide sleeves, box frames, or both, for openings in floors, walls, partitions, and ceilings for all electrical work

that passes through construction. Refer to Division 26 Section "Common Work Results for Electrical".

- B. Provide sleeves, box frames, or both, for all conduit, cable, and busways that pass through masonry, concrete or block walls.
- C. The cutting of new and/or existing construction will not be permitted except by written approval of the Architect.

3.6 CUTTING AND PATCHING

- A. Provide all necessary cutting of walls, floors, ceilings and roofs for work under this Division.
- B. Cut no structural member without permission from Architect.
- C. Patch around all openings to match adjacent construction.
- D. After the final waterproofing membrane has been installed, roofs may be cut only with written permission by the Architect.

3.7 PAINTING

- A. Refer to Division 09 Section "Painting" for painting requirements.
- B. Paint exposed ferrous surfaces, including, but not limited to, hangers, equipment stands and supports using materials and methods as specified under individual Sections; colors shall be as selected by the Architect.
- C. Re-finish all field-threaded ends of galvanized conduits and field-cut ends of galvanized supports with a cold-galvanizing compound approved for use on conductive surfaces. Follow closely manufacturer's instructions for pre-cleaning surfaces and application.
- D. Factory finishes and shop priming and special finishes are specified in the individual equipment Specification sections.
- E. Where factory finishes are provided and no additional field painting is specified, touch up or refinish, as required by, and to the acceptance of, the Architect and Engineer, marred or damaged surfaces so as to leave a smooth, uniform finish. If, in the opinion of the Architect or Engineer, the finish is too badly damaged to be properly re-finished, replace the damaged equipment or materials at no additional costs to the Owner.

3.8 CLEANING

- A. Remove dirt and refuse, resulting from the performance of the Work, from the premises as required to prevent accumulation. Cooperate in maintaining reasonably clean premises at all times.

- B. Immediately prior to final inspection, make a final cleanup of dirt and refuse resulting from Work and assist in making the premises broom clean. Clean all material and equipment installed under this Division.
- C. Remove dirt, dust, plaster, stains, and foreign matter from all surfaces.
- D. Touch up and restore damaged finishes to their original condition.

3.9 ADJUSTING, ALIGNING AND TESTING

- A. Adjust, align and test all electrical equipment furnished and/or installed under this Division.
- B. Check motors for alignment with drive and proper rotation and adjust as required.
- C. Check and test protective devices for specified and required application and adjust as required.
- D. Check, test and adjust adjustable parts of all light fixtures and electrical equipment as required to produce the intended performance.
- E. Verify that completed wiring system is free from short circuits, unintentional grounds, low insulation impedances, and unintentional open circuits.
- F. After completion, perform tests for continuity, unwanted grounds, and insulation resistance in accordance with the requirements of NFPA 70 and NETA.
- G. Be responsible for the operation, service and maintenance of all new electrical equipment during construction and prior to acceptance by the Owner of the complete project under this Contract. Maintain all electrical equipment in the best operating condition including proper lubrication.
- H. Notify the Architect immediately of all operational failures caused by defective material, labor, or both.
- I. Maintain service and equipment for all testing of electrical equipment and systems until all Work is approved and accepted by the Owner.
- J. Keep a calibrated voltmeter and ammeter (true RMS type) available at all times. Provide service for test readings when and as required.
- K. Refer to individual Sections for additional and specific requirements.

3.10 START-UP OF SYSTEMS

- A. Prior to start-up of electrical systems, check all components and devices, lubricate items appropriately, and tighten all screwed and bolted connections to manufacturers' recommended torque values using appropriate torque tools.

- B. Each power, lighting and control circuit shall be energized, tested, and proved free of breaks, short-circuits and unwanted grounds.
- C. Adjust taps on each transformer for rated secondary voltages.
- D. Balance all single-phase loads at each panelboard, redistributing branch circuit connections until balance is achieved to plus or minus 10 percent.
- E. Replace all burned-out lamps. Replace the lamps of all light fixtures that use incandescent, halogen or quartz lamp sources that are installed as part of the finished building, but are used by the Contractor during construction, with new lamps of appropriate type and wattage prior to turning the facility over to the Owner or Tenant.
- F. After all systems have been inspected and adjusted, confirm all operating features required by the Drawings and Specifications and make final adjustments as necessary.
- G. Demonstrate that all equipment and systems perform properly as designed per Drawings and Specifications.
- H. At the time of final review and tests of the power and lighting systems, all equipment and system components shall be in place and all connections at panelboards, switches, circuit breakers, and the like, shall be complete. All fuses shall be in place, and all circuits shall be continuous from point of service connections to all switches, receptacles, outlets, and the like.

3.11 TEST REPORTS

- A. Perform tests as required by these Specifications and submit the results in the operations and maintenance manuals. The tests shall establish the adequacy, quality, safety, and reliability for each electrical system installed. Notify the Architect and Engineer two working days prior to each test.
- B. For specific testing requirements of special systems, refer to the Specification section that describes that system.
- C. Upon completing each test, record the results, date and time of each test and the conditions under which the test was conducted. Submit to the Architect, for Engineer's review, in duplicate, the test results for the following electrical items:
 - 1. Building service entrance voltage and amperes at each phase.
 - 2. Electrical service grounding conditions and grounding resistance.
 - 3. Proper phasing throughout the entire system
 - 4. Voltages (phase-to-phase and phase-to-neutral) and amperes at each phase for each panelboard, switchboard, and the like.
 - 5. Phase voltages and amperes at each three-phase motor.
 - 6. Test all wiring devices for electrical continuity and proper polarity of connections.
- D. Promptly correct all failures or deficiencies revealed by these tests as determined by the Engineer.

3.12 SUBSTANTIAL COMPLETION REVIEW

- A. Prior to requesting a site observation for "CERTIFICATION OF SUBSTANTIAL COMPLETION", complete the following items:
 - 1. Submit complete Operation and Maintenance Data.
 - 2. Submit complete Record Drawings.
 - 3. Perform all required training of Owner's personnel.
 - 4. Turn over all spare parts and extra materials as specified in Section 017700.
 - 5. Perform start-up tests of all systems.
 - 6. Remove all temporary facilities from the site.
 - 7. Comply with all requirements for Substantial Completion in the Division 01 and General Conditions.
- B. Request in writing a review for Substantial Completion. Give the Architect at least seven (7) days' notice prior to the review.
- C. State in the written request that the Vendor has complied with the requirements for Substantial Completion.
- D. Upon receipt of a request for review, the Architect will either proceed with the review or advise the Contractor of unfilled requirements.
- E. If the Contractor requests a site visit for Substantial Completion review prior to completing the above-mentioned items, he shall reimburse the Architect and Engineer for time and expenses incurred for the visit.
- F. Upon completion of the review, the Architect and Engineer will prepare a "final list" of outstanding items to be completed or corrected for final acceptance.
- G. Omissions on the "final list" shall not relieve the Contractor from the requirements of the Contract Documents.
- H. Prior to requesting a final review, submit a copy of the final list of items to be completed or corrected. State in writing that each item has been completed, resolved for acceptance or the reason it has not been completed.

END OF SECTION 260010

**AGREEMENT FOR TRANSFER OF INFORMATION
MACHINE-READABLE FORMAT**

PROJECT NAME: _____ PROJECT NO/PHASE: _____

Made this day, _____

By and Between **pb2 architecture + engineering** (hereinafter referred to as ENGINEER) and _____ (hereinafter referred to as RECIPIENT).

The enclosed electronic media are provided pursuant to your request for the purpose of production of shop drawings or record drawings. In using it, modifying it, or accessing information from it, you are responsible for confirmation, accuracy, and checking of the data from the media. ENGINEER hereby disclaims any and all responsibility from any results obtained in use of this electronic media and does not guarantee any accuracy of the information.

RECIPIENT agrees that it shall not use the information provided by ENGINEER for any purpose other than that described above without the express written consent of ENGINEER. RECIPIENT also hereby acknowledges that the data delivered by ENGINEER is for use by RECIPIENT only, and is not to be released to any other party without the written consent of the ENGINEER and does not transfer ownership of the instruments of professional service.

RECIPIENT understands that the automated conversion of information and data from the system and format used by ENGINEER to an alternate system or format cannot be accomplished without the possibility of introduction of inexactitudes, anomalies, and errors. In the event project documentation provided to RECIPIENT in machine readable form is so converted, RECIPIENT agrees to assume all risk associated therewith, and to the fullest extent permitted by law, to hold harmless and indemnify ENGINEER from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees, arising therefrom or in connection therewith.

RECIPIENT recognizes that changes or modifications to ENGINEER'S instruments of professional service introduced by anyone other than ENGINEER may result in adverse consequences that ENGINEER can neither predict nor control. Therefore, and in consideration of ENGINEER'S agreement to deliver its instruments of professional service in machine readable format, RECIPIENT agrees, to the fullest extent permitted by law to hold harmless and indemnify ENGINEER from and against all claim, liabilities, losses, damages, and costs, including misuse or reuse by others of the machine readable information and data provided by ENGINEER under this Agreement. The foregoing indemnification applies, without limitation, to any use of the project documentation on another project, for additions to this project, or for completion of this project by others; ENGINEER may authorize excepting only such use in writing.

Send a check for shipping and handling costs in the amount of \$200 for an electronic drawing set up to 12

sheets plus \$15 per sheet in excess of 12 sheets payable to ENGINEER. along with completed and signed agreement and Architect's written authorization to receive electronic media. Be sure to indicate below the desired shipping method, format type and media type.

Sheet numbers

requested: _____

1-12 sheets @ \$200 + _____ sheet(s) @ \$15 each = \$ _____ total due to ENGINEER.

ENGINEER

RECIPIENT

Signature _____

Signature _____

Date _____

Date _____

Shipping Method:

Format:

Media:

E-Mail

AutoCAD 2000/2002

CD-ROM

First Class Mail

AutoCAD 2004/2005

DVD

FedEx Overnight (No P.O.Boxes)

DXF

Shipping or E-Mail Address:

Phone: _____

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SECTION 260050

COMMON WORKS FOR ELECTRICAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included

1. Work shall consist of furnishing all labor, equipment, supplies and materials, unless otherwise specified, necessary for the installation of complete electrical systems as required by the specifications and as shown on the drawings, subject to the terms and conditions of the contract. The work shall also include the completion of those details of electrical work not mentioned or shown which are necessary for the successful operation of all electrical systems.

B. Work Not Included

1. Certain labor, materials, and equipment may be furnished under other sections of these specifications, by Utility Companies or by the Owner; when this is the case, the extent, source, and description of these items will be as indicated on the drawings or as described in the specification.

1.2 PROVISIONS

A. Work performed under this division of the specifications shall conform to the requirements of Division 1, the electrical drawings, and all items hereinafter specified.

1. Prior to any work being performed under this division, examine architectural, structural, food service, civil, mechanical, specialty systems, and interior design drawings and specifications. If any discrepancies occur between them and the electrical drawings and specifications, report discrepancies to the Architect in writing and obtain written instructions for the work.
2. Electrical drawings are diagrammatic but shall be followed as closely as actual construction of the building will permit. All changes from drawings necessary to make the electrical work conform to the building as constructed shall be made without additional cost to the Owner.
3. Coordinate the electrical work with the General Contractor and be responsible to him for satisfactory progress of the same. Coordinate electrical work with all other trades on the project without additional cost to the Owner.
4. All work and materials covered by drawings and specifications shall be subject to review at any time by representatives of the Architect and Owner. If the Architect or Owner's agent finds any materials or installation that does not conform to these drawings and specifications, Contractor shall remove the material from the premises and correct the installation to the satisfaction of the agent.

5. In acceptance or rejection of installed electrical systems, no allowance will be made for lack of skill on the part of the installers.

1.3 CODES AND STANDARDS

- A. Project shall conform to the current national, state and/or local adopted editions of the following codes and standards, including supplements and official interpretations, as enforced by the local authorities having jurisdiction (AHJs):
 1. International Building Code.
 2. International Mechanical Code.
 3. International Fire Code.
 4. NFPA 70 - National Electrical Code (NEC).
 5. NFPA 70E - National Electrical Safety Code (NESC).
 6. NFPA 72 – National Fire Alarm Code.
 7. NFPA 101 – Life Safety Code.
 8. NFPA 110 – Emergency Power Systems
 9. American National Standards Institute (ANSI).
 10. Americans with Disabilities Acts (ADA) and ANSI 117.
 11. Institute of Electrical and Electronic Engineers (IEEE).
 12. Underwriter’s Laboratories (UL).
 13. National Electrical Manufacturer’s Association (NEMA).
 14. Insulated Cable Engineers Association (ICEA).
 15. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
 16. Colorado Department of Health Rules and Regulations Governing Restaurants in the State of Colorado□.
- B. The complete installation shall comply with requirements of the utility and telephone companies furnishing service to this installation. The drawings and specifications take precedence when they are more stringent than codes, statutes, or ordinances in effect. Applicable codes, ordinances, standards and statutes take precedence when they are more stringent or conflict with the drawings and specifications.

1.4 SPECIAL REQUIREMENTS

- A. Definitions: “Provide” shall mean “furnish and install”. “Furnish” means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application. “Install” means to join, unit, fasten, link, attach, set up or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation. The words “accept” or “acceptable” denote only that the equipment items are in general conformance with the design concept of the project.
- B. Drawings:

1. The drawings indicate the general arrangement of circuits and outlets, locations of switches, panelboards and other work. Information shown on the drawings is schematic, however, re-circuiting will not be permitted without specific acceptance. Drawings and specifications are complementary to each other. What is called for by one shall be as binding as if called for by both. Data presented on these drawings is accurate as planning can be determined, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit field conditions is directed. Review all Architectural, Structural and Mechanical Drawings and Specifications; adjust all work to conform to all conditions shown therein. The Architectural drawings shall take precedence over all other drawings.
2. Discrepancies between different plans, between plans and specifications, between specifications or regulations and codes governing this installation shall be brought to the attention of the Architect in writing before the date of bid opening. In the event such discrepancies exist, and the Architect is not so notified, the adjudication of responsibility shall be solely at the discretion of the Architect.

1.5 EXAMINATION OF BIDDING DOCUMENTS

- A. Each bidder shall examine the bidding documents carefully, and not later than seven days prior to the date of receipt of bids, shall make written request to the Engineer for interpretation or correction of any discrepancies, ambiguity, inconsistency, or error therein which he may discover. Any interpretation or correction will be issued as an addendum by the Architect. Only a written interpretation or correction by addendum shall be binding. No bidder shall rely upon interpretations or corrections given by any other method. If discrepancies, ambiguity, inconsistency, or error are not covered by addendum or written directive, Contractor shall include in his bid, labor materials and methods of construction resulting in higher cost. After award of contract, no allowance or extra compensation will be made on behalf of the Contractor due to his failure to make the written requests as described above.
- B. Failure to request clarification during the bid period of any inadequacy, omission, or conflict will not relieve the Contractor of their responsibilities. The signing of the contract will be considered as implicitly denoting that the Contractor has a thorough comprehension of the full intent and scope of the working drawings and specifications.

1.6 PERMITS, FEES & NOTICES

- A. Obtain and pay for all necessary permits, inspections and certificates that may be necessary for the full completion of the work. Furnish the Architect with a certificate of final inspection and approval from the AHJ over the electrical installation.
- B. Notify proper authorities when work is ready for inspections required by applicable codes, rules and regulations, allowing sufficient time for inspections to be made without hindering progress of the work. Furnish to the Owner copies of inspection certificates of acceptance.

1.7 TESTS

- A. Upon completion of all work and adjustment of all equipment, provide complete operational tests of all electrical equipment provided under this division.

1.8 RECORD DRAWINGS

- A. Maintain a current set of electrical drawings at the site. Neatly mark all changes and deviations from the original drawings. Use a color which contrasts with the prints. This shall be a separate set of drawings, not used for construction purposes, and shall be kept up to date as the job progresses and shall be made available for inspection by the Architect at all times. These updated progress drawings shall be used to produce the final record drawings that shall be in AutoCad electronic format media upon project completion.
- B. Upon completion of the contract, both sets (electronic and hard copy drawings) of record drawings shall be delivered to the Architect.
- C. The Contractor shall mark all record drawings on the front lower right hand corner with a stamp impression that reads 'RECORD DRAWINGS' or similar.

1.9 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prior to submitting a bid, visit the site of job and ascertain all conditions affecting the proposed installation and adjust all work accordingly. Make provisions for these costs.
- C. Coordinate the work with that of all other trades. Where conflicts of work occur and departure from the indicated arrangements are necessary, consult with other Contractors involved; come to agreement as to changed locations and elevations, etc., and obtain written acceptance from the Architect of proposed changes before proceeding with work.
- D. All outages of electrical service shall be scheduled with the Owner and Utility Company five (5) days in advance of proposed outage. Include an overtime allowance in the bid for the performance of all work requiring outages at such time as it is approved by the Owner. Outages shall be at a time and of such duration as accepted by the Owner.

1.10 SEQUENCING AND SCHEDULING

- A. Construct Work in sequence under provisions of Division 1.

1.11 USE OF THE ARCHITECT'S AND/OR ENGINEER'S DRAWINGS

- A. The Contractor shall obtain, at the Contractor's expense, from the Architect or Engineer a set of AutoCAD or compatible format architectural and engineering drawings on electronic media where desired by the Contractor and/or required by the Specifications for use in preparing the shop drawings, coordination drawings, and record drawings. The Contractor shall provide to the Architect and Engineer a written release of liability acceptable to the Architect and Engineer prior to receiving the electronic media.

PART 2 - **GENERAL**

2.1 STANDARD FOR MATERIALS

- A. All materials shall conform to current applicable industry standards. Workmanship and neat appearance shall be as important as the electrical and mechanical operation. Defective or damaged materials shall be replaced or repaired, prior to final acceptance, in a manner acceptable to the Architect or Owner at no additional cost to the Owner.
- B. All electrical materials shall be acceptable for installation only if labeled or listed by a nationally recognized testing laboratory and if accepted by local authorities.

2.2 SUBMITTALS

- A. Submit under provision of Division 1.
- B. Listing of Equipment: The Contractor shall submit, within thirty days after the award of the contract, a complete typewritten list of those items of equipment which will be furnished under this contract. Include the name or description of the item, name of manufacturer, model, type, and catalog number.
- C. Present shop drawing submittal data at one time, bound in three-ring binders, indexed in a neat and orderly manner. Partial submittals will not be accepted. Do not begin work until (1) copy is returned.
- D. Submit five (5) copies of shop drawings, layouts, manufacturer's data, wiring diagrams and material schedules that may be requested by the Architect for his review. The review by the Architect will not constitute concurrence with any deviation from the plans and specifications unless such deviations are specifically identified by the method described below, nor shall it relieve the Contractor of responsibility for errors or omissions in the submitted data.

- E. Processed shop drawings shall not be construed as change orders. The shop drawings shall demonstrate that the Contractor understands the design concept, indicate which equipment and materials he intends to provide, and detail the fabrication and installation methods he intends to use. If deviations, discrepancies or conflicts between shop drawing submittals and the design drawings and specifications are discovered, the design drawings and specifications shall govern.
- F. Contractor shall be responsible for dimensions (which he shall confirm and correlate at the job site), fabrication processes and techniques of construction and coordination of his work with that of other trades. The Contractor shall check and verify all measurements and review shop drawings before submitting them and sign a statement on the shop drawings which signifies that they comply with plans and specifications and that equipment is dimensionally suitable for the application. If any deviations from the specified requirements for any item of material or equipment exist, such deviation shall be expressly stated in writing and incorporated with the submittal. The Owner's copies (two of each) of the reviewed submittals shall be retained by the Contractor until completion of the project and presented in bound form to the Owner.
- G. Provide, with shop drawing submittal, 1/4" scale layout drawings of room with switchboards, transformers, telephone backboards, panelboards, and data equipment. Layouts shall show locations of, and shall be coordinated with mechanical equipment. Equipment shall be drawn to scale.

2.3 BID ALTERNATE(S)

- A. Refer to Division 1 and all contract documents for additional information.
- B. Alternate(s) for Material and Equipment
 - 1. Equipment and material bid alternate(s) shall be proposed as additive or deductive alternate(s) to specified items by submitting it as a separate line item from the base bid on the Bidder's letterhead.
 - 2. Such bid alternate proposals shall not be substituted or included in the base bid. Bid alternate proposal(s) must be accompanied by full descriptive data on the proposed equipment, together with a statement of the cost to be added or deducted for each item. The bid alternate shall include all materials, equipment, labor, electrical connections, coordination with all other trades, etc. for a complete and operational system.
 - 3. The Contractor shall submit the bid alternates at the time the base bids are due.

2.4 SUBSTITUTION AND APPROVALS (Prior Approvals)

- A. Prior to Bidding: Where items of equipment or materials are specified by a manufacturer's name, type, model, or catalog number, only those items may be used in the base bid unless prior written acceptance of other material has been published by addendum.

1. Submit applications for this review in triplicate at least ten (10) calendar days prior to bid opening.
2. Applications for review shall be accompanied by a typewritten list of the specified manufacturer and catalog number and shall state all significant details in which each item differs from the item specified. Failure to list this information shall not relieve the Contractor from providing properly functioning or fitting materials regardless of the review action taken by the Architect. The Contractor will provide only materials which have been specified or accepted prior to bid opening, under his base bid.
3. Equipment and materials not listed as equivalents may be proposed as deductive alternates to specified items by submitting it as a separate line item from the base bid on the Bidder's letterhead.
4. Such substitution proposals shall not be substituted or included in the base bid. Substitution proposal must be accompanied by full descriptive data on the proposed equipment, together with a statement of the cost to be deducted for each item. If any such substitutions are considered, the Contractor shall submit a list of the proposed substitution items within 14 days of award of contract. The request for proposed substitutions shall not be accepted by the Engineer due to scheduling or delivery concerns.

B. Substitutions of Material after Award of Contract

1. Other items of material and equipment may be offered (at the Contractor's option) as alternates to specified items, either as provided for in the Proposal Forms or, if no provisions are made, by submitting it with his bid on the Bidder's letterhead.
2. Such alternate proposal shall not be included under the base bid and must be accompanied by full descriptive data on the proposed equipment, together with a statement of the cost to be added or deducted for each item. If any such alternate material proposals are considered, the Contractor shall submit a list of the proposed alternate substitution items in accordance with the requirements of "Review of Proposed Substitutions".

2.5 SUBSTITUTIONS (CONTRACTOR AND/OR OWNER INITIATED)

- A. Materials or equipment listed by several manufacturers' names are intended to be bidder's choice, and any of the listed manufacturers may be used in the base bid. Materials or equipment not listed are considered substitutions.
- B. Performance Specification: When any item is specified by requirement to meet a performance, industry or regulating body standard or is specified generically (no manufacturer's name listed), no prior review by the Consulting Electrical Engineer is needed unless specifically called for in these specifications.
- C. Contractor to be responsible for any changes and costs to accommodate any equipment except the first named in the specification.
- D. Substitutions for Material

1. Equipment and materials not listed as equivalents may be proposed as deductive alternates to specified items by submitting it as a separate line item to the base bid on the Bidder's letterhead.
2. Such substitutions shall not be substituted for the base bid and must be accompanied by a full description of the difference between the Contract Document requirements and that of the substitution, the comparative features of each, and the effect of the change on the end result performance. Include the impact of all changes on other contractors and acknowledge the inclusion of additional costs to the other trades. If any such alternates are considered, the Contractor shall submit a list of the proposed alternate substitution items within 14 days of award of contract. Late requests for proposed substitutions will not be accepted by the Engineer due to scheduling or delivery concerns.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND COMPLETION OF INSTALLATION

- A. Contractor's personnel and subcontractors selected to perform the work shall be well versed and skilled in the trades involved.
- B. Coordinate electrical equipment and materials installation with other building components.
- C. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
- D. Any changes or deviations from the drawings and specifications must be accepted in writing by the Architect/Engineer. All errors in installation shall be corrected at the expense of the Contractor. All specialties shall be installed as detailed on the drawings. Where detail or specific installation requirements are not provided, manufacturer's recommendations shall be followed.
- E. Upon completion of work, all equipment and materials shall be installed complete, thoroughly checked, correctly adjusted, and left ready for intended use or operation. All work shall be thoroughly cleaned and all residue shall be removed from surfaces. Exterior surfaces of all material and equipment shall be delivered in a perfect, unblemished condition.
- F. Contractor shall provide a complete installation, including all required labor, material, cartage, insurance, permits, and taxes.

3.2 PROGRESS OF WORK

- A. Order the progress of electrical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit. Any cost resulting from defective or ill-timed work performed under this Section shall be borne by this Contractor.

B. TRENCHING AND BACKFILLING

- C. Perform all trenching and backfilling required by work performed under this Section in accordance with the excavating and grading specifications as herein specified. This work shall comply with the requirements of Table 300-5 of the National Electrical Code.
- D. Excavate trenches to the depth required for the utilities involved. The trench bottom shall be graded true and free from stones or soft spots. Trenches through specially treated or surfaced areas, such as paving or blacktop, shall have the width of the surface cutting extended for a width of eight inches (8") on each side of the open trench. Unless otherwise noted, the disturbed surfaces shall be replaced equal to the original construction, to the original grade with the same type of material, and to the same depths and limits as the materials removed. After acceptance by the Architect, backfill, tamp, and compact to insure against the possibility of differential settling, in conformity with Division 2 Specifications. Verify location of existing or new utilities and, if damaged by this Contractor, replace or repair.

3.3 CHASES, OPENINGS, CUTTING, AND PATCHING

- A. Carefully lay out all work in advance so as to eliminate where possible, cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings and roofs. Any damage to the building, structure, piping, ducts, equipment or any defaced finish shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner and to the satisfaction of the Architect. Any necessary cutting, channeling, drilling or anchoring of raceways, outlets, or other electrical equipment shall be performed in a careful manner, and as accepted by the Architect.
- B. All openings made in fire-rated walls, floors, or ceilings shall be patched and made tight in a manner to conform to the fire rating for the surface penetrated.
- C. All penetrations required through existing concrete construction shall be core drilled at minimum size required. Precautions shall be taken when drilling to prevent damage to structural concrete. Contractor shall obtain permission from the Architect before proceeding with drilling.
- D. Provide all cutting, trenching, backfilling, patching and refinishing or resurfacing required for electrical work in a manner meeting the approval of the Engineer and at no additional cost to the Owner.

3.4 DELIVERY AND STORAGE OF MATERIALS

- A. Arrange and be held responsible for delivery and safe storage of materials and equipment for electrical installation.
- B. Store materials and equipment for easy inspection and checking.
- C. Carefully mark and store all materials.
- D. Deliver materials to the job site in stages of the work that will expedite the work as a whole.
- E. Carefully check materials furnished to this Contractor for installation and provide receipt acknowledging acceptance of delivery and condition of the materials received. Thereafter, assume full responsibility for its safekeeping until the final installation has been reviewed and accepted.

3.5 PROTECTION OF WORK AND PROPERTY

- A. Where there are existing facilities, be responsible for the protection thereof, whether or not such facility is to be removed or relocated. Moving or removing any facility must be done so as not to cause interruption of the work of Owner's operation.
- B. Close all conduit openings with caps or plugs during installation. Cover all fixtures and equipment and protect against injury. At the final completion, clean all work and deliver in an unblemished condition, or refinish and repaint at the discretion of the Architect.
- C. Any equipment or conduit systems found to have been damaged or contaminated above "MILL" or "SHOP" conditions shall be replaced or cleaned to the Engineer's satisfaction.

3.6 FINAL ACCEPTANCE

- A. Final acceptance by the Owner will not occur until all operating instructions are received and Owner's personnel have been thoroughly indoctrinated in the maintenance and operation of all equipment.
- B. Operating manual, parts lists, and indoctrination of operating and maintenance personnel: Furnish the services of a qualified representative of the supplier for each item or system itemized below who shall instruct specific personnel, as designated by the Owner, in the operation and maintenance of that item or system.
- C. Instruction shall be made when the particular system is complete and shall be of the number of hours indicated and at the time requested by the Owner. A representative of the Electrical Contractor shall be present for all demonstrations.

1. Electrical distribution equipment (<600V)	2

2.	Digital metering (other than utility)	2
3.	Engine generator and transfer switches	4
4.	Uninterruptible Power Supply (UPS) system	4
5.	Lighting control systems	4

- D. Deliver three (3) complete operating manuals and parts lists to the Owner (or his designated representative) at the time of the above required indoctrination. Fully explain the contents of the manuals as part of required indoctrination and instruct the Owner's personnel in the correct procedure in obtaining service, both during and after the guarantee period. The operating manual and parts lists shall give complete information as to whom the Owner shall contact for service and parts, including the address and phone number. Furnish evidence that an authorized service organization regularly carries a complete stock of repair parts for these items (or systems), and that the organization is available for service. Service shall be furnished within twenty four (24) hours after requested.
- E. Clean up: Remove all materials, scrap, etc., relative to the electrical installation and leave the premises and all equipment, lamps, fixtures, etc. in a clean, orderly condition. Any costs to the Owner for clean up of the site will be charged against the Contractor.
- F. Acceptance Demonstration: Upon completion of the work, at a time to be designated by the Architect, the Contractor shall demonstrate for the Owner the operation of the entire installation, including all systems provided under this contract.
- G. Operating and Acceptance Tests: Provide all labor, instruments, and equipment for the performance of tests as specified. Submit three (3) copies of a typewritten test report for the Architect for his approval.
 - 1. Record the full load current in each phase or line at the main service entrance and for each feeder leaving the main distribution panelboard. Readings shall be taken with the maximum installed load connected and in operation.
 - 2. Perform a careful inspection of the main switchboard bus structure and cable connections to verify that all connections are mechanically and electrically tight.
 - 3. Measure the resistance to ground for the service ground, which shall not exceed ten (10) ohms under normal soil moisture conditions. If required, install additional ground provisions in a manner accepted by the Engineer at no additional cost to the Owner.

3.7 ELECTRICAL PROVISIONS FOR ROOFS

- A. Raceways penetrating roofs shall be installed in a manner to preserve the integrity of the roof. Provide flashing and counter flashing for all roof penetrations required for the work.
- B. Conduits routed above roofs shall be installed a minimum of twelve inches (12") above the finished roof surface, supported on metal stands installed with flashing and counter flashing, with maximum spacing of ten feet (10'-0").

- C. Provide weatherproof duplex receptacles on roof so that no equipment installed on the roof is more than twenty-five feet (25'-0") from a receptacle. Connect to nearest receptacle circuit unless indicated on plans.

3.8 CONSTRUCTION LIGHTING AND POWER

- A. Provide all temporary facilities required to supply construction power and light. Install and maintain facilities in a manner that will protect the public and workmen. Comply with all applicable laws and regulations.
- B. Provide covered walkway lights and obstruction lights which shall be kept burning continuously between sunset and sunrise where required.
- C. Upon completion of the work, remove all temporary facilities from the site.
- D. The General Contractor shall pay for all power and light used by him and his subcontractors where construction power is separately metered, or is taken from the permanent project metered service solely for construction use.
- E. The cutoff date for power cost allocation where permanent meters are used shall be either the agreed date of occupancy by the Owner or the date of final acceptance of the project, whichever shall be the earlier date.

3.9 MECHANICAL EQUIPMENT WIRING AND CONNECTIONS

- A. Unless otherwise indicated, all motors and controls shall be furnished, set in place, and wired in accordance with the Mechanical Equipment Wiring and Connections Schedule. All items necessary for a complete system shall be included in the base contract.
- B. Provide electrical connections to mechanical equipment. Refer to the Mechanical specifications and plans covering sprinkler systems, motor interlocks, switching, etc. Provide wiring, conduit, outlets and final electrical connections to all equipment.
- C. Where motor controllers are furnished by others, install controller and provide connections at line and load side of controllers.
- D. Where reduced voltage, multiple speed, duplex, triplex, lead-lag, pony motor and other unusual controller types are utilized, coordinate specific requirements of motor(s) and controller and provide required wiring between motor(s) and controller.
- E. Provide branch circuits and connections to sump and sewage ejector pump alarm bell system. Connect to emergency power distribution system.
- F. Where electric duct heaters are provided with remote power panels, provide branch circuits between remote panel and duct heater elements in accordance with the equipment manufacturer's recommendations.

- G. For electric water coolers verify whether the equipment is hard wired, cord and plug connected and whether a remote chiller is provided. Provide circuiting and connections to match.

3.10 ELEVATORS

- A. Locate equipment and points of connection in elevator machine rooms and elevator pits in accordance with the requirements of the elevator vendor and the Authority Having Jurisdiction.
- B. Provide a fused switch or circuit breaker, dedicated 3-phase branch circuit, and power connection for each elevator. Fused switch or circuit breaker shall be located within elevator machine room. Circuit breaker rating shall be in accordance with elevator manufacturer's requirements.
- C. Provide a dedicated 120V, 20A circuit with lockable disconnect switch and connection to each elevator cab for elevator cab lighting and ventilation.
- D. Provide a dedicated 120V, 20A circuit and connect to elevator system intercom in elevator machine room.
- E. Provide a dedicated circuit and connect to each elevator controller for control power. Circuit rating shall be in accordance with the elevator vendor's requirements.
- F. Provide a dedicated circuit for weatherproof lighting fixtures, lighting switches and duplex receptacles within each elevator pit. Lighting shall provide 19 foot-candles minimum, and shall be accomplished with 4'-0" 2-lamp fluorescent strip fixtures with wire guard. If pit is painted white provide one such fixture, otherwise provide two.
 - 1. For traction elevators (no machine rooms), also provide lighting and service receptacle at top of shaft similar to pit requirements.
- G. Provide a dedicated telephone outlet for each elevator. Provide an empty ¾" raceway from each telephone outlet to the nearest telephone backboard.
- H. Provide empty raceways from elevator shafts to the elevator control and status panel(s). Size, quantity and location of raceway termination points shall be in accordance with the elevator vendor's requirements.
- I. Provide a fire alarm speaker within each elevator cab. Connect to the Fire Management System –Voice Communication System.
- J. Provide a firefighter's telephone jack in each elevator cab. Connect to Fire Management System—Firefighter's Telephone System.
- K. Connect power supply circuits serving elevators and related controls and accessories to the emergency power distribution system.

- L. Provide conduit and wire between elevator controllers and automatic transfer switches and make connections required for automatic recall and operation of elevators from the emergency power distribution system in the event of power failure.

3.11 KITCHEN EQUIPMENT

- A. For all kitchen equipment provided under other divisions of these specifications, provide wiring and make up all final electrical connections in accordance with the manufacturer's shop drawings and recommendations. Where equipment in open areas is served from under floor wiring, terminate conduit in a flush coupling at the floor or suitable watertight box, from which point extend a rigid conduit nipple at least eight inches above the floor. Provide flexible conduit connections to the equipment. Make all conduit connections at the floor watertight.
- B. Provide junction boxes, outlets, stainless steel cover plates cords and plugs, disconnect switches and other appurtenances not built into kitchen equipment but required for a complete installation.
- C. Kitchen hood fire protection system:
 - 1. Provide 120V, 20A dedicated circuit to fire protection system control panel. Connect to emergency power system.
 - 2. Provide shunt trip breakers and/or contactors with connections to fire protection control panel to automatically disconnect power to electrical equipment (including kitchen hood lighting fixtures) located beneath the kitchen hood upon activation of the fire protection system. Restoration of power will first require clearing the fire alarm signal and the manual reapplication of power.
 - 3. Provide connections to solenoid gas valves and gas service reset system to automatically interrupt gas service to equipment located beneath the kitchen hood upon activation of the fire protection system.
 - 4. Provide connections to kitchen hood water wash system for automatic operation upon activation of the fire protection system.
 - 5. Provide a local kitchen exhaust fan control switch for each kitchen hood. Connect to kitchen hood exhaust and make up fans for automatic operation upon activation of the fire protection system.
 - 6. Connect kitchen hood fire protection system to building fire alarm system. Provide a separate alarm zone and a separate trouble zone for each kitchen hood fire protection system.
- D. Walk-in type refrigerators and freezers:
 - 1. Provide connections to remote temperature sensors indicating devices.
 - 2. Provide connections to freezer door heating coils.
- E. Provide empty conduits for beverage dispensing lines. Size and quantities of conduits shall be in accordance with the food service equipment vendor's requirements.
- F. Interlock exhaust and make up fans serving dishwashing hoods for automatic operation with dishwashing equipment.

3.12 OWNER PROVIDED EQUIPMENT

- A. Provide electrical connections to owner furnished equipment.
- B. Inspect owner furnished equipment for damage, defects, missing components, etc. Report deficiencies to the Owner immediately. Do not install or connect deficient equipment.
- C. Provide supports, fastenings, and auxiliary hardware necessary for a complete installation in accordance with the finished building conditions.

3.13 EMERGENCY POWER OFF CONTROLS

- A. Provide emergency power off controls for boiler rooms.
- B. Provide controls, relays, contactors, conduit and wire for the following functions:
 - 1. Activation of shunt trip breakers and contactors to disconnect power to equipment within the boiler room.
- C. Provide an emergency power off switch at each exit door of boiler room. Emergency power of switch shall be Allen-Bradley Bulletin 800T break-glass push button station NEMA type 13 with break-glass kit. Provide a legend plate for each unit with designation: POWER/AC SHUTDOWN.

3.14 PERMANENTLY INSTALLED EXTERIOR SPAS

- A. Provide an emergency power off switch within 5 feet from the inside walls of the spa. Emergency power off switch shall be Allen-Bradley Bulletin 800T push button station NEMA type 3R with hinged clear plastic cover. Provide a legend plate for each unit with designation: POWER/AC SHUTDOWN.
- B. Provide controls, relays, contactors, conduit and wire to activate shunt trip breakers and contactors to disconnect power spa motors and heater.
- C. Provide a 120-volt receptacle located a minimum of 10 feet from the inside wall of the spa and not more than 20 feet. The receptacle shall not be located more than 78 inches above the level of the spa. The receptacle branch circuit shall have GFCI protection.
- D. Branch circuit conductors with GFCI protection shall be in dedicated raceway systems without conductors that do not have GFCI protection.

END OF SECTION

SECTION 260502 – EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes limited for electrical connections to equipment specified under other Section or Divisions or furnished under separate contracts by the Owner.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories:
 - 1. Listed and labeled as defined in NFPA 70, Article 100, by an NRTL as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 2. Marked for intended use.
- B. Comply with NFPA 70.

1.3 COORDINATION

- A. Unless otherwise noted, perform all electrical Work required for the proper installation and operation of equipment, furnishings, devices, and systems specified in other Divisions of these Specifications, furnished under other contracts, and/or furnished by the Owner for installation under this Contract.
- B. Coordinate work with Division 23 Section, "Electrical Coordination for Mechanical Equipment".
- C. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.
- D. Determine connection locations and rough-in requirements based on Shop Drawings.
- E. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- F. Sequence electrical connections to coordinate with start-up schedule for equipment.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

- A. Attachment Plugs: Conform to NEMA WD 1.
- B. Configuration: NEMA WD 6, matching receptacle configuration at outlet provided for equipment, or as required by the equipment manufacturer.

- C. Cord: See Paragraph "Flexible Cords" in Division 26 Section "Low-voltage Electrical Power Conductors and Cables".
- D. Provide cord size suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify conditions of equipment and installation prior to beginning work.
- B. Verify that equipment is ready for connecting, wiring and energizing.

3.2 ELECTRICAL DEVICES

- A. Install disconnect switches, controllers, control stations, and control devices (other than temperature control devices) as indicated.
- B. Install disconnect switches, controllers, control stations, and control devices (other than temperature control devices) specified in other Divisions of these Specifications, furnished under other contracts, and/or furnished by the Owner for installation under this Contract.

3.3 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturers' instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit with watertight connectors in damp or wet locations.
- C. Make wiring connections using conductors and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated on the Drawings.
- E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Provide interconnecting conduit and wiring between devices and equipment where indicated on the Drawings.

3.4 HVAC EQUIPMENT

- A. When equipment is delivered in separate parts and field assembled, internal wiring, indicated on Shop Drawings as field wiring, will be provided by the equipment supplier, unless otherwise noted.

END OF SECTION 260502

SECTION 260504 - PROVISIONS FOR ELECTRIC UTILITY SERVICE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Provisions for Underground Secondary Electrical Service.
- B. Utility service voltage.
 - 1. As indicated on the Drawings.
- C. Utility service ampacity: as indicated on the Drawings.
- D. The extent of Work for the secondary electrical service includes providing the following:
 - 1. Raceways
 - 2. Provisions for Metering
 - 3. Grounding and Bonding
 - 4. Concrete pad for service transformer
 - 5. Service lateral

1.2 SUBMITTALS

- A. General: Submit the following in accordance with Division 01 and Division 26 Section "General Electrical Requirements":
 - 1. Product data for the following products for:
 - a. Meter bases
 - 2. Shop drawings for:
 - a. Utility Company prepared installation drawings.
 - b. Cast-in-place concrete pads
- B. Where equipment or materials are specified to comply with utility standards and are listed above as required submittals, obtain approval from the serving utility before submitting to the Architect.
- C. Record Drawings: Submit Record Drawings as required by Division 01 and Division 26 Section "General Electrical Requirements":
 - 1. Accurately record actual routing of all exterior buried raceway and all interior conduits two inches and larger. Indicate dimensions from fixed structural elements.

1.3 QUALITY ASSURANCE

- A. Perform all work in accordance with Utility Company installation drawings and service standards.
- B. Maintain one copy of Utility Company installation drawings and service standards at the site.
- C. Prior to commencing work in this Section, meet with the Utility Company representative to review service entrance requirements and details.
- D. Verify that field measurements are as indicated on Utility Company drawings.
- E. Electrical Components, Devices, and Accessories:
 - 1. Listed and labeled as defined in NFPA 70, Article 100, by an NRTL as defined by OSHA in 29 CFR 1910.7, and that are acceptable to authorities having jurisdiction.
 - 2. Marked for intended use.
- F. Comply with NFPA 70.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SECONDARY SERVICE ENTRANCE UNDERGROUND

- A. Provide an underground secondary service lateral from the pad mounted transformer in accordance with NFPA 70 Article 230 and the Utility Company standards. Reference the Drawings for service lateral conductor and raceway quantities, sizes, and types.
- B. Provide a concrete pad, complying with the Utility Company standards, for transformer mounting, and set GRS conduit elbows and riser(s), with grounding bushing(s), to receive primary and secondary raceways. Where direct burial primary is used, set GRS conduit elbow(s) and riser(s), with grounding bushing(s), to receive primary cables.
- C. Make connections to the secondary terminals of the transformer as required and in conformance with Utility Company requirements. Utility Company will provide primary conductors and terminal connections unless otherwise directed by the Utility Company.

3.2 METERING

- A. Provide a 2-inch empty GRS conduit, with pull cord, from the secondary compartment of the pad-mounted service transformer to the meter location shown on the Drawings, or as directed by Utility Company.
- B. Provide a meter base complying with the Utility Company standards.

3.3 UTILITY SERVICE CHARGES

- A. It shall be the responsibility of the contractor to apply for the electrical service, including the preparation and completion of all forms. Submit the completed application along with all other required documentation for the new or modified service.
- B. Contractor to pay all Utility Company charges for providing electric service, including all charges for bringing primary service conductors to the site.

END OF SECTION 260504

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1.2 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Alpha Wire; brand of Belden, Inc.
2. Belden Inc.
3. Encore Wire Corporation.
4. General Cable; Prysmian Group North America.
5. Okonite Company (The).
6. Service Wire Co.
7. Southwire Company, LLC.
8. WESCO.

2.2 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2, Type THHN/THWN-2, Type XHHW-2 and Type SO.

C. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC and Type SO with ground wire.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.4 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN-2, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. Metal-clad cable, Type MC may be used:
 - 1. When not restricted otherwise.
 - 2. In lieu of flexible conduit and wiring from light fixtures in accessible ceilings to junction boxes (attached to building structure) above the ceiling. Provide cable whips of sufficient lengths to allow for relocating each light fixture within a 5-foot radius of its installed location, but not exceeding 6 feet in unsupported lengths.
 - 3. Maximum length of any run of 15'-0".

4. Contractors shall conceal MC Cable, if used, in such a manner that it cannot be seen from the sales floor.

J. Metal-clad cable, Type MC may NOT be used:

1. For homeruns to panelboards.
2. Where exposed to view.
3. Where exposed to damage.
4. Hazardous locations.
5. Wet locations.
6. When restricted otherwise above, and when specifically disallowed by the local AHJ and/or Owner.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- G. GFCI-protected circuits.
 1. Do not use multi-conductor circuits, with a shared neutral, for any GFCI circuit breaker or receptacle circuit.
- H. Isolated Ground (IG) Circuits:
 1. Do not use multi-conductor or MC cables.
 2. Do not share neutrals between separate circuits.
 3. The equipment grounding conductor may be shared between IG circuits sharing a common raceway.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements.
 - a. All HVAC equipment
 - b. Branch circuits serving IDF Rooms.
 - c. Cash register, customer service and cash room branch circuits
 - d. All three phase loads
 - e. All interior and exterior lighting branch circuits
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Test and Inspection Reports: Prepare a written report to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.3 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Grounding arrangements and connections for separately derived systems.
 - 4. Locations of bonds to all existing grounding electrodes and metal piping systems.
- B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Instructions for periodic testing and inspection of grounding features at test wells and grounding connections for separately derived systems based on NETA MTS.
 - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - 2) Include recommended testing intervals.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. Dossert; AFL Telecommunications LLC.
 - 3. ERICO International Corporation.
 - 4. Fushi Copperweld Inc.
 - 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - 6. Harger Lightning & Grounding.
 - 7. ILSCO.
 - 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 9. Robbins Lightning, Inc.
 - 10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4-inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.4 CONNECTORS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors
 - 1. Compression Connectors: Burndy Hyground, or equal, permanent, pure, wrought copper, meeting ASTM 8 1 87, essentially the same as the conductors being connected; clearly and permanently marked with the information listed below:
 - a. Company symbol and/or logo.
 - b. Catalog number.
 - c. Conductors accommodated.
 - d. Installation die index number or die catalog number is required
 - e. Underwriters Laboratories "Listing Mark:".
 - f. The words "Suitable for Direct Burial" or, where space is limited, "Direct Burial" or "Burial" per UL Standard ANSI/UL467 (latest revision).
 - 2. Cast connectors: copper base alloy according to ASTM B 30 (latest revision).
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions. GROUNDING ELECTRODES
- D. Ground Rods: UL-listed:
 - 1. Copper-clad steel; bonded copper electrolytically applied to minimum thickness of 10 mils.
 - 2. Size: 5/8-inch by 8 feet. Provide sectional types when longer rods are indicated.

PART 3 - EXECUTION

3.1 GENERAL

- A. Examine areas and conditions under which electrical grounding connections are to be made and notify the Architect/Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Provide all materials, labor, and equipment for an electrical grounding system in accordance with applicable portions of the NEC and NECA. Coordinate electrical work as necessary to interface installation of electrical grounding systems with other work.
- C. Accomplish grounding and bonding of electrical installations and specific requirements for systems, circuits and equipment required to be grounded for both temporary and permanent construction.

3.2 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In branch circuit and feeder raceways, use insulated equipment grounding conductors.
- C. Underground Grounding Conductors: Bury at least 24 inches below grade, or 6 inches below the official frost line, whichever is greater.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Separately Derived Systems: Bond the derived neutral (grounded) conductor of all separately derived system (e.g., transformers, generators, UPS) to the nearest available grounding electrode, or back to the service grounding electrode if no approved electrodes are readily available. Size the grounding electrode conductor and bonding jumpers as indicated on the Drawings or as required by NFPA 70 Table 250.66, whichever is larger.
- C. Isolated Ground (IG) Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
 - 1. Do not use multi-conductor or MC cables.
 - 2. Do not share neutrals between separate circuits.
 - 3. The equipment grounding conductor may be shared between IG circuits sharing a common raceway.
- D. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- E. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- F. Water Heater: Install a separate equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components. On water heaters, bond metal hot and cold-water pipes together, across the heater tank.
- G. Metal Poles Supporting Outdoor Luminaires: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors. See Evaluations for discussion of fence grounding.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes shall be at least 12 inches deep, with cover.
 - 1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

- G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- H. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
 - 1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 - 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.5 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible. Provide electrical bonding plates, connectors, terminals, lugs and clamps as recommended by the manufacturers for indicated applications. Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, and bonding straps as recommended by the manufacturers for types of service indicated.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Replace welds that are puffed up or that show convex surfaces indicating improper cleaning. Use exothermic welded connections for the following:
 - 1. Connecting conductors together.
 - 2. Connecting conductors to ground rods, except at test wells.
 - 3. Connecting conductors to building steel.
 - 4. Connecting conductors to plates.
- C. Compression Fittings: Permanent compression-type fittings may be used for the following rather than exothermic connections:
 - 1. Connecting conductors together.
 - 2. Connecting conductors to building steel.
 - 3. Connecting conductors to ground rods, except at test wells.
- D. Mechanical Pressure Fittings: Use bolted mechanical (removable) pressure-type clamps for the following:
 - 1. Connecting conductors to ground rods at test wells.
 - 2. Connecting conductors to pipes.

- E. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- F. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- G. Tighten screws and bolts for grounding and bonding 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.
- H. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- I. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the fall-of-potential method according to IEEE 81.
 - 3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
 - 4. Test Values:
 - a. The resistance between the main grounding electrode and earth ground shall be no greater than 10 ohms.
 - b. Equipment Rated 500 kVA and Less: 10 ohms.

5. Perform point-to-point megohmmeter tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.
6. Minimum system neutral-to-ground insulation resistance: one megohm.'
7. Investigate point-to-point resistance values that exceed 0.5 ohms.
 - a. Check for loose connections.
 - b. Check for absent or broken connections.
 - c. Check for poor quality welds.
 - d. Consider other reasons.
8. Excessive Grounding Electrode Resistance: If measured resistance to earth ground value exceeds specified values, notify Architect promptly and include recommendations and costs to reduce them.

END OF SECTION 260526

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SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.2 QUALITY ASSURANCE

- ##### A. Welding Qualifications:
- Qualify procedures and personnel according to AWS D1.1/D1.1M.

1.3 COORDINATION

- ##### A. Coordinate size and location of concrete bases.
- Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- ##### B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.
- These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- ##### A. Steel Slotted Support Systems:
- Comply with MFMA-4 factory-fabricated components for field assembly.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation, A Member of the ABB Group.
 - f. Unistrut; an Atkore International company.
 - g. Wesanco, Inc.
 2. Material: Galvanized steel.
 3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 7. Channel Dimensions: Selected for applicable load criteria.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
 - C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
 - D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
 - E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.
- B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with single-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMTs, IMCs, and RMCs may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4-inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4-inches thick.
6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 09 for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.2 DEFINITIONS

- A. EMT: Electrical Metallic Tubing
- B. FMC: Flexible Metal Conduit
- C. IMC: Intermediate Metal Conduit
- D. LFMC: Liquidtight Flexible Metal Conduit
- E. LFNC: Liquidtight Flexible Nonmetallic Conduit
- F. RMC: Rigid Metal Conduit
- G. RNC: Rigid Nonmetallic Conduit
- H. GRC: Galvanized rigid steel conduit.

1.3 INFORMATIONAL SUBMITTALS

- A. Record Drawings: Submit Record Drawings as required by Division 01 and Division 26 Section "General Electrical Requirements". Accurately record actual routing of all exterior buried raceway and all interior raceways three inches and larger. Indicate dimensions from fixed structural elements.

1.4 QUALITY ASSURANCE

- A. Materials shall be manufactured by companies that have been specializing in the products specified in this Section, for a minimum of 3 years.

- B. Electrical Components, Devices, and Accessories:
 - 1. Listed and labeled as defined in NFPA 70, Article 100, by an NRTL as defined by OSHA in 29 CFR 1910.7, and that is acceptable to AHJ.
 - 2. Marked for intended use.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit; a part of Atkore International.
 - 3. Anamet Electrical, Inc.
 - 4. Electri-Flex Company.
 - 5. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 6. Republic Conduit.
 - 7. Robroy Industries.
 - 8. Southwire Company.
 - 9. Thomas & Betts Corporation, A Member of the ABB Group.
 - 10. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. IMC: Comply with ANSI C80.6 and UL 1242.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch, minimum.
- F. EMT: Comply with ANSI C80.3 and UL 797.
- G. FMC: Comply with UL 1; zinc-coated steel.
- H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Fittings for EMT:
 - a. Material: Steel or die cast.

- b. Type: Setscrew or compression.
- 2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.
 - 3. Arnco Corporation.
 - 4. CANTEX INC.
 - 5. CertainTeed Corporation.
 - 6. Condux International, Inc.
 - 7. Electri-Flex Company.
 - 8. Lamson & Sessions.
 - 9. RACO; Hubbell.
 - 10. Thomas & Betts Corporation, A Member of the ABB Group.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. LFNC: Comply with UL 1660.
- F. Rigid HDPE: Comply with UL 651A.
- G. Continuous HDPE: Comply with UL 651B.
- H. Coil-able HDPE: Preassembled with conductors or cables and complying with ASTM D 3485.
- I. RTRC: Comply with UL 1684A and NEMA TC 14.
- J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- K. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2. Hoffman; a brand of Pentair Equipment Protection.
 - 3. MonoSystems, Inc.
 - 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type or Screw-cover type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Cooper Technologies Company.
 - 2. Erickson Electrical Equipment Company.
 - 3. FSR Inc.
 - 4. Hoffman; a brand of Pentair Equipment Protection.
 - 5. Hubbell Incorporated.
 - 6. Milbank Manufacturing Co.
 - 7. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 8. RACO; Hubbell.
 - 9. Robroy Industries.
 - 10. Spring City Electrical Manufacturing Company.
 - 11. Thomas & Betts Corporation, A Member of the ABB Group.
 - 12. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb. shall be listed and marked for the maximum allowable weight.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- K. Cabinets:
 - 1. Compliance: NEMA 250; UL 50 and 508A, as applicable.
 - 2. NEMA Type 1: Code-gauge phosphatized steel with continuously welded seams; manufacturer's standard ANSI 61 gray polyester powder finish inside and out; non-gasketed removable hinged front cover, with flush keyed latch and concealed hinge; collar studs.
 - 3. NEMA Type 3R: Code-gauge galvanized steel with drip shield top, seam-free front, side, and back; manufacturer's standard ANSI 61 gray polyester powder finish inside and out; non-gasketed continuous-hinged door, with stainless steel pin; captive, plated steel cover screws; hasp and staple for padlocking; collar studs.
 - 4. Removable painted steel interior panel mounted on standoffs; metal barriers to separate wiring of different systems and voltages.
 - 5. Where keyed locks are indicated, provide 2 keys for each enclosure, with all locks keyed alike.
 - 6. Provide enclosures wider than 36 inches with double doors; removable center posts; internal bracing, supports, or both, as required to maintain their structural integrity; and, accessory feet where required for freestanding equipment.
 - 7. Provide clamps, grids, slotted wireways, or similar devices to which or by which wiring may be secured. Provide DIN-rail mounted terminal strips for terminating all incoming and outgoing control wiring, and power terminal blocks for incoming/outgoing power wiring.
 - 8. Provide metal barriers to separate compartments containing control wiring operating at less than 50 volts from power and higher-voltage control wiring.

2.5 FACTORY FINISHES

- A. Finish: For metal wireway and surface raceway, enclosure, or cabinet components, provide manufacturer's standard prime coat finish ready for field painting.
- B. Finish: For metal wireway and surface raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled metal wireway and surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. General

1. Comply with NECA 1 for installation requirements applicable to produce specified in Part 2 except where requirements on drawings or in this article are stricter.
2. Provide sizes and types of raceways as indicated on the Drawings. Sizes are based on THWN insulated copper conductors, except where noted otherwise. Where sizes are not shown on the Drawings or in the Specifications, size raceways in accordance with NFPA 70 requirements for the number, size and type of conductors installed. Minimum raceway size: 1/2 inch (concealed and exposed); 1 inch (underground and under slab).
3. Provide all raceways, fittings, supports, and miscellaneous hardware required for a complete electrical system as described by the Drawings and Specifications.
4. Install a green-insulated, equipment-grounding conductor, which is bonded to the electrical system ground, in all raceways, with the exception of Service Entrance raceways.
5. Install grounding bushings on all conduit terminations and bond to the enclosure, equipment grounding conductor, and electrical system ground.
6. Install raceways concealed in walls or above suspended ceilings in finished areas. Do not install raceways horizontally within slabs on grade.
7. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
8. Keep raceways at least 6-inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
9. Make bends and offsets so inside diameters are not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
10. Install raceways:
 - a. To meet the requirements of the structure and the requirements of all other Work on the Project.
 - b. To clear all openings, depressions, ducts, pipes, reinforcing steel, and so on.
 - c. Within or passing through the concrete structure in such a manner so as not to adversely affect the integrity of the structure. Become familiar with the Architectural and Structural Drawings and their requirements affecting the raceway installation. If necessary, consult with the Architect.
 - d. Parallel or perpendicular to building lines or column lines.

- e. In exposed structure areas install in roof structural members (do not install conduits below bottom chord of roof joist).
 - f. When concealed, with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
11. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
- a. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - b. Space raceways laterally to prevent voids in concrete.
 - c. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - d. Change from RNC to coated GRS or IMC before rising above the floor.
12. Where masonry walls are left unfinished, coordinate raceway installations with other trades so that the raceways and boxes are concealed, and the wall will have a neat and smooth appearance.
13. Support raceways from structural elements of the building as required by NFPA 70, Division 26 Section "Hangers and Supports for Electrical Systems". Do not support raceways by hangers used for any other systems foreign to the electrical systems; and, do not attach to other foreign systems. Do not lay raceways on top of the ceiling system.
14. Provide support spacing in accordance with NFPA 70 requirements, and at a minimum in accordance with NEMA standards. Support by the following methods:
- a. Attach single raceway directly to structural steel with beam clamps.
 - b. Attach single raceway directly to concrete with one-hole clamps or clips and anchors. Outdoors and wherever subject to dampness or moisture, offset raceways from the surface by using galvanized clamps and clamp backs, to mitigate moisture entrapment between raceways and surfaces.
 - c. Attach groups of raceways to structural steel with slotted support system attached with beam clamps. Attach raceway to slotted channel with approved raceway clamps.
 - d. Attach groups of raceways to concrete with cast-in-place steel slotted channel fabricated specifically for concrete embedment. Attach raceway to steel slotted channel with approved raceway clamps.
 - e. Hang plumb horizontally suspended single raceway using a threaded rod. Attach threaded rods to concrete with anchors and to structural steel with beam clamps. Attach raceway to threaded rod with approved raceway clamps.
 - f. Hang horizontally suspended groups of raceways using steel slotted support system suspended from threaded rods. Attach threaded rods to concrete with anchors and to structural steel with beam clamps. Attach raceway to steel slotted channel with approved raceway clamps.
 - g. Support conductors in vertical raceway in accordance with NFPA 70 requirements.

- h. Cross-brace suspended raceway to prevent lateral movement during seismic activity.
 - i. Use pre-fabricated non-metallic spacers for parallel runs of underground or under-slab conduits, either direct buried, or encased in concrete.
- 15. Install electrically- and physically continuous raceways between connections to outlets, boxes, panelboards, cabinets, and other electrical equipment with a minimum possible number of bends and not more than the equivalent of four 90-degree bends between boxes. Make bends smooth and even, without flattening raceway or flaking the finish.
- 16. Protect all electrical Work against damage during construction. Repair all Work damaged or moved out of line after rough-in, to meet the Architect's approval, without additional cost to the Owner. Cover or temporarily plug openings in boxes or raceways to keep raceways clean during construction. Clean all raceways prior to pulling conductors or cables.
- 17. Align and install raceway terminations true and plumb.
- 18. Complete raceway installation before starting conductor installation.
- 19. Install a pull cord in each empty raceway that is left empty for installation of wires or cables by other trades or under separate contracts. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull cord.
- 20. Install approved expansion/deflection fittings where raceways pass through or over building expansion joints.
- 21. Route raceway through roof openings for piping and ductwork or through roof seals approved by the Architect, the roofing contractor, or both. Obtain approval for all roof penetrations and seal types from the Architect, Owner, roofing contractor, or all three as required to maintain new or existing roofing warranties.
- 22. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces or from building exterior to building interior.
 - b. Where otherwise required by NFPA 70.
- 23. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with EMT; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- 24. All raceways installed above sales floor shall be routed on the BOTTOM of the top cord of bar joist or joist girders but no closer than 1.5 inches from the bottom of the deck to the top of the raceway.

B. RMC

- 1. Use GRS or IMC in the following areas:
 - a. Where indicated.

- b. Exterior applications where above grade and exposed.
- c. Below grade when concrete-encased, plastic-coated, or provided with a corrosion resistant approved mastic coating.
- d. All raceways penetrating slabs on grade (use plastic-coated raceway or provide with a corrosion resistant approved mastic coating). This shall include the 90-degree elbow below grade and the entire vertical transition to above grade.

C. EMT

1. Use EMT in the following areas:
 - a. Where indicated.
 - b. Interior concealed locations for:
 - 1) Branch and feeder circuits.
 - 2) Low-voltage control, security, and fire alarm circuits
2. Do not use EMT.
 - a. Below grade.
 - b. In exterior applications when exposed.

D. FMC and LFMC

1. Use FMC or LFMC:
 - a. For the final 24 inches of raceway to all motors, transformers, and other equipment subject to vibration or movement.
 - b. From outlet boxes (attached to building structure) to recessed light fixtures. Install sufficient length to allow for relocating each light fixture within a 5-foot radius of its installed location.
2. Do not use FMC or LFMC:
 - a. For branch circuits, homeruns, or feeders.
 - b. In lengths exceeding 6 feet.
3. Use FMC only in dry locations; use LFMC in damp, wet, corrosive, and outdoor locations.

E. RNC

1. Solvent-weld RNC fittings and raceway couplings per the manufacturer's instructions and make all connections watertight. Use solvent of the same manufacturer as the raceway.
2. Where installed exposed outdoors or other areas subject to temperature variations, install expansion fittings per Article 352.44 of NFPA 70, to accommodate thermal expansion in straight runs.
3. Use RNC in the following locations:

- a. Only where specifically indicated, and then only as specified below.
- b. Underground, single and grouped, in lieu of GRS or IMC, when indicated.
 - 1) Direct buried.
 - 2) Concrete-encased (use approved rigid PVC interlocking spacers, selected to provide minimum duct spacing and cover depths indicated while supporting ducts during concreting and backfilling; produced by the same manufacturer as the ducts).

4. Do not use RNC:

- a. Exposed indoors.
- b. In occupied spaces.
- c. In return air plenums.
- d. Where subject to physical damage.
- e. Where not permitted by codes.

F. Raceway Fittings: Compatible with raceways and suitable for use and location.

- 1. RMC and IMC: Use threaded rigid steel conduit fittings, unless otherwise indicated.
- 2. Join raceways with fittings designed and approved for that purpose and make joints tight.
- 3. Use insulating bushings to protect conductors at raceway terminations:
 - a. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - b. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

G. Telephone and Signal/Data System Raceways, 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150-feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

H. Wireways

- 1. Use flat head screws, clips, and straps to fasten wireways to surfaces. Mount plumb and level.
- 2. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.
- 3. Close ends of wireway and unused raceway openings.

3.2 BOXES

A. General

- 1. Verify locations of device boxes prior to rough in.

2. Set boxes at elevations to accommodate mounting heights as specified or indicated on the Drawings.
3. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box locations to accommodate intended purpose.
4. Install boxes to preserve fire ratings of walls, floors, and ceilings.
5. Install flush wall-mounted boxes without damaging wall insulation or reducing its effectiveness.
6. Support boxes independently of raceway.
7. Clean the interior of boxes to remove dust, debris, and other material. Clean exposed surfaces and restore finish.
8. Adjust flush-mounted boxes to make front edges flush with finished wall material.
9. Provide boxes of the depth required for the service, device, and the application, and with raised covers set flush with the finished wall surface for boxes concealed in plaster finishes. Select covers with the proper openings for the devices being installed in the boxes. Install boxes flush unless otherwise indicated.
10. Install outlet boxes in firewalls complying with UL requirements, with box surface area not exceeding 16 square inches; and, when installed on opposite sides of the wall, separate by a distance of at least 24 inches.

B. Outlet Boxes

1. Install all electrical devices, such as plug receptacles, lamp receptacles, light switches, and light fixtures in or on outlet boxes.
2. Locations of outlets on Drawings are approximate; and, except where dimensions are shown, determine exact dimensions for locations of outlets from plans, details, sections, or elevations on Drawings, or as directed by Architect. Locate outlets generally from column centers and finish wall lines or to centers or joints of wall or ceiling panels.
3. Locate outlet boxes so they are not placed back-to-back in the same wall, and in metal stud walls, so they are separated by at least one stud space, to limit sound transmission from room to room. Install outlet boxes in accessible locations and do not install outlets above ducts or behind furring.
4. Install extension and plaster rings as required by NFPA 70.
5. Carefully set outlet boxes concealed in non-plastered block walls so as to line up with wall joints. Coordinate the box and raceway installation with the wall construction as required for a flush and neat appearing installation. Outlet box extensions may be used where necessary.
6. Do not exceed allowable fill per NFPA 70.
7. Where multiple devices are shown grouped together, gang mount with a common cover plate.

C. Junction and Pull Boxes

1. Install junction and pull boxes above accessible ceilings and in unfinished areas.
2. Provide boxes set flush in painted walls or ceilings with primer coated cover.
3. Where junction and pull boxes are installed above an inaccessible ceiling, locate so as to be easily accessible from a ceiling access panel.
4. Only one (1) pull trough may be installed in the store. That trough may only be installed directly above the switchboard. All other boxes to contain a maximum of 16 conductors.

5. Boxes for exterior use shall be:

- a. PVC with a UV-stabilized PVC cover sealed and gasketed watertight.
- b. Cast aluminum with a cast aluminum cover sealed and gasketed watertight.
- c. Cast iron with cast iron cover sealed and gasketed watertight in vehicular traffic areas. Provide box and cover UL listed for use in vehicular traffic areas.
- d. Install buried boxes so that box covers are flush with grade, unless indicated otherwise.

D. Floor Boxes

1. Use cast or non-metallic floor boxes for installations in slab on grade. Unless otherwise indicated, formed steel boxes are acceptable for slabs above grade.
2. Set metal floor boxes level and flush with finished floor surface.
3. Set non-metallic floor boxes level. Trim after installation to fit flush with finished floor surface.

E. Cabinets and Enclosures

1. Unless otherwise indicated on the Drawings, provide NEMA 1 construction for indoor, dry locations; NEMA 12 for indoor, damp, and dusty locations; NEMA 3R for outdoor locations.
2. Install flush mounted in the wall in finished spaces, with the top 78 inches above finished floor. The front shall be approximately 3/4-inch larger than the box all around.
3. Install surface mounted in unfinished spaces, with the top 78 inches above finished floor. The front shall be the same height and width as the box.
4. Electrically ground all metallic cabinets and enclosures. Where wiring to cabinet or enclosure includes a grounding conductor, provide a grounding lug in the interior of the cabinet or enclosure. Cabinets and enclosures specified in this Section are intended to house miscellaneous electrical components assembled in a custom arrangement, such as contactors and relays.
5. All components that are specified or indicated for assembly in cabinets and enclosures shall each be individually UL listed and labeled. Arrange wiring so that it can be readily identified. Support wiring no less than every 3 inches. Install gauges, meters, pilot lights and controls on the face of the door.
6. Do not provide cabinets and enclosures smaller than the sizes indicated. Where sizes and types are not indicated, provide cabinets and enclosures of the size, type and classes appropriate for the use and location per the guidelines of the NEC. Provide all items complete with covers and accessories required for the intended use.

3.3 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors except where otherwise restricted in this article.
- B. Keep raceways at least 6-inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12-inches of enclosures to which attached.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- K. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- L. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- M. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- N. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

- P. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- Q. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- R. Locate boxes so that cover or plate will not span different building finishes.
- S. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- T. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.4 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60-inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
 - 5. Silicone sealants.
- B. Related Requirements:
 - 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.
- C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. O-Z/Gedney.
 - e. Pipeline Seal and Insulator, Inc.
 - f. Proco Products, Inc.
 - 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Plastic.
 - 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall, so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall, and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

- B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.

- B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic and wind forces required to select seismic and wind restraints and for designing vibration isolation bases.

- a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
- 3. Seismic- and Wind-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
 - d. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
- B. Qualification Data: For professional engineer and testing agency.
- C. Welding certificates.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear

and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

- E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed (3-second gust): 107mph.
2. Building Classification Category: II.
3. Minimum 10 lb/sq. ft. multiplied by maximum area of electrical component projected on vertical plane normal to wind direction and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

1. Seismic Design Category as Defined in the IBC: B.
2. Assigned Seismic Use Group of Building Category as Defined in the IBC: II.
 - a. Component Importance Factor for General Equipment: 1.0.
 - b. Component Importance Factor for Emergency Lighting, Egress signage and power serving Fire Protection components: 1.5
 - c. Component Response Modification Factor: 1.5.
 - d. Component Amplification Factor: 1.0.
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.124.
4. Design Spectral Response Acceleration at 1.0-Second Period: 0.084.

2.2 RESTRAINT CHANNEL BRACINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.; a Division of Cooper Industries.
2. Hilti, Inc.
3. Mason Industries, Inc.
4. Unistrut; Atkore International.

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Loos & Co., Inc.
3. Vibration Mountings & Controls, Inc.

- B. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.; a Division of Cooper Industries.
 2. Kinetics Noise Control, Inc.
 3. Mason Industries, Inc.
 4. TOLCO; a brand of NIBCO INC.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.; a Division of Cooper Industries.
 2. Hilti, Inc.
 3. Kinetics Noise Control, Inc.
 4. Mason Industries, Inc.
- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.6 ADHESIVE ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hilti, Inc.
 - 2. Kinetics Noise Control, Inc.
 - 3. Mason Industries, Inc.
- B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an evaluation service member of ICC-ES.
- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."
- B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- F. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 5. Set anchors to manufacturer's recommended torque using a torque wrench.
 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.

C. Seismic controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548.16

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for conductors.
2. Underground-line warning tape.
3. Warning labels and signs.
4. Instruction signs.
5. Equipment identification labels, including arc-flash warning labels.
6. Miscellaneous identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with NFPA 70, ASME A13.1, IEEE C2.
- B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- C. Comply with ANSI Z535.4 for safety signs and labels, Z535.1 for safety colors.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Warning labels and signs shall include, but are not limited to, the following legends:
 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 42 INCHES."

2.3 LABELS

A. Self-Adhesive Labels:

1. Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
 - a. Nominal Size: 3.5-inch-by-5-inch.

2. Marker for Tags: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

2.4 TAPES AND STENCILS:

A. Underground-Line Warning Tape

1. Tape:
 - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
2. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

2.5 SIGNS

- A. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- B. Baked-Enamel Signs:
 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 2. 1/4-inch grommets in corners for mounting.
 3. Nominal Size: 7-inches by 10-inches.
- C. Metal-Backed Butyrate Signs:
 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing and with colors, legend, and size required for application.
 2. 1/4-inch grommets in corners for mounting.
 3. Nominal Size: 10-inches by 14-inches.
- D. Laminated Acrylic or Melamine Plastic Signs:
 1. Engraved legend.
 2. Thickness:

- a. For signs up to 20 sq. inches, minimum 1/16-inch thick.
- b. For signs larger than 20 sq. inches, 1/8-inch thick.
- c. Engraved legend with white letters on a dark grey background.
- d. Self-adhesive.
- e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16-inch.
 - 2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16-inch.
 - 2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.
 - 1. Minimum Width: 3/16-inch.
 - 2. Tensile Strength at 73 deg F according to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- D. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

E. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16-inches overall.

3.2 IDENTIFICATION SCHEDULE

A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for service, feeder, and branch-circuit wiring.

- a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
- b. Colors for 208/120-V Circuits:

- 1) Phase A: Black.
- 2) Phase B: Red.
- 3) Phase C: Blue.
- 4) Neutral: White
- 5) Equipment Ground: Green
- 6) Isolated Ground: Green with Yellow Stripe

c. Colors for 480/277-V Circuits:

- 1) Phase A: Brown.
- 2) Phase B: Orange.
- 3) Phase C: Yellow.
- 4) Neutral: Gray (except as provided in NFPA 70)
- 5) Ground: Green

B. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

1. Install underground-line warning tape for direct-buried cables and cables in raceways.

C. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.

- D. Arc Flash Warning Labeling: Self-adhesive thermal transfer vinyl labels.
 - 1. Comply with NFPA 70E and ANSI Z535.4.
- E. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- F. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.
- G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine plastic label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

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SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Indoor occupancy sensors.
2. Switch-mounted occupancy sensors.
3. Indoor daylight sensors.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Materials shall be manufactured by companies that have been specializing in the products specified in this Section, for a minimum of 3 years.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

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

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Manufacturing Co., Inc.
4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. Lutron Electronics Co., Inc.
6. Philips Lighting Controls.
7. Sensor Switch, Inc.
8. Watt Stopper.

- B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes. When indicated to operate as a vacancy sensor, the device shall be programmed to turn the lights off automatically but shall require lights to be manually turned on by operating the Bypass Switch.
 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 5. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 7. Bypass Switch: Override the "on" function in case of sensor failure.
- C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
 3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot-high ceiling.
- D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.

5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet.
- E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Cooper Industries, Inc.
 2. Hubbell Building Automation, Inc.
 3. Leviton Manufacturing Co., Inc.
 4. Lutron Electronics Co., Inc.
 5. Philips Lighting Controls.
 6. Sensor Switch, Inc.
 7. Watt Stopper.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
 3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 2500-VA fluorescent at 277 V.
 4. Gray color.

2.3 INDOOR DAYLIGHT SENSOR

- A. Ceiling Mounted
1. Light-Level Monitoring Range: 1 to 1,500 fc.
 2. Operating Temperature: 32°F to 131°F (0 °C to 55 °C)
 3. Relative Humidity: less than 90%, non-condensing.
 4. Spatial Response: 60°
 5. Line Voltage Input: 120-277V
 6. Low Voltage Input: 12-24VDC
 7. Control Type

- a. On/Off: The control zone is automatically turned off if the daylight reading exceeds the defined setpoint and automatically turned on if the daylight reading is below the defined setpoint. A time delay may be used to prevent nuisance on/off switching.
- b. Continuous Dimming: The control zone automatically adjusts its dimming output in response to the daylight readings, such that a minimum light level consisting of both electric light and daylight sources is maintained at the task.

B.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- C. Set time delay on occupancy sensor to maximum delay time, not to exceed 30 minutes.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
- B. Identify circuits controlled by photoelectric and occupancy sensors at each sensor.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Perform the following tests and inspections:

1. Operational Test: After installing sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lighting control devices will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 ADJUSTING

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

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

END OF SECTION 260923

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Refer to Section 002213 Supplementary Instructions to Bidders, Items Furnished by Owner and comply with all requirements including use of Forms A – Forms E.
- B. This Section includes distribution dry-type transformers rated 600 V and less, with capacities up to 150 kVA.
- C. Transformers shall be factory installed in the integrated facility switchboard per specification section 262413.21.
- D. Transformers are furnished through Academy preferred vendor.

1.2 ACTION SUBMITTALS

- A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, technical certification sheets and performance for each type and size of transformer indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
 - 2. Transformer ratings including:
 - a. kVA
 - b. Primary and secondary voltage
 - c. Taps
 - d. Basic impulse level (BIL) for equipment over 600 volts
 - e. Design impedance
 - f. Insulation class and temperature rise
 - g. Sound level.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.5 SEQUENCING AND SCHEDULING

- A. The responsibility of Work under this Section includes, but is not limited to, the following:
 - 1. Contact the Owner's Electrical Equipment Supplier to coordinate and schedule delivery to site.
 - 2. Refer to drawings and specifications for a list of Owner's preferred Vendors and Contractors. If not listed on the Drawings, contact the Owner for a preferred Vendors list.
 - 3. Contractor shall ensure that Vendor receives the latest issue of revised drawings and/or specifications as soon as they are in the possession of the Contractor.
 - 4. Prior to ordering products from Vendor, Contractor shall verify that Vendor has received that latest set of revised drawings and/or specifications. Any modifications, replacements and additions required to products due to failure to keep Vendor informed shall be the responsibility of the Contractor and shall be supplied or performed at no additional cost to owner and/or Academy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Transformers are furnished through Academy preferred vendor.

2.2 DISTRIBUTION TRANSFORMERS

- A. Comply with NFPA 70, and list and label as complying with UL 1561.
- B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- C. Transformers Rated 15 kVA and Larger: Comply with NEMA TP 1 energy-efficiency levels as verified by testing according to NEMA TP 2.
 - 1. Coil Material: Aluminum.

2.3 IDENTIFICATION DEVICES

- A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.4 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.

2.5 FACTORY TESTING

- A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

1. Ratio tests at the rated voltage connection and at all tap connections
2. Polarity and phase relation tests on the rated voltage connection
3. Applied potential tests
4. Induced potential test
5. No-load and excitation current at rated voltage on the rated voltage connection

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Remove shipping bolts, blocking, and wedges.

3.2 CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. 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-486B.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS for dry-type, air-cooled, low-voltage transformers. Certify compliance with test parameters.
- B. Remove and replace units that do not pass tests or inspections and retest as specified above.

3.4 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
- B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

END OF SECTION 262200

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SECTION 262413.21 - INTEGRATED FACILITIES SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Refer to Section 002213 Supplementary Instructions to Bidders, Items Furnished by Owner and comply with all requirements including use of Forms A – Forms E.
- B. Drawings 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. Electrical service and distribution equipment furnished through Academy preferred vendor.
- B. Section Includes:
 - 1. A free standing, dead-front type low-voltage distribution switchboard, utilizing group mounted circuit protective devices, integrated panelboards, transformers, Surge Protection Devices, Nexrev Energy Management controls as specified herein, and as shown on the drawings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
- B. Shop Drawings: For each switchboard and related equipment.
 - 1. Detail enclosure types for types other than NEMA 250, Type 1.
 - 2. Detail bus configuration, current, and voltage ratings.
 - 3. Detail short-circuit current rating of switchboards and overcurrent protective devices.
 - 4. Include evidence of NRTL listing for series rating of installed devices.
 - 5. Include schematic and wiring diagrams for power, signal, and control wiring.
- C. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Routine maintenance requirements for switchboards and all installed components.

2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 2.
- D. Comply with NFPA 70.
- E. Comply with UL 891.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.
- B. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) or connect factory-installed space heaters to temporary electrical service to prevent condensation.
- C. Handle and prepare switchboards for installation according to NECA 400.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations:
 1. Do not deliver or install switchboards until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).

1.7 COORDINATION

- A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.8 SEQUENCING AND SCHEDULING

- A. The responsibility of Work under this Section includes, but is not limited to, the following:
 - 1. Contact the Owner's Electrical Equipment Supplier to coordinate and schedule delivery to site.
 - 2. Refer to drawings and specifications for a list of Owner's preferred Vendors and Contractors. If not listed on the Drawings, contact the Owner for a preferred Vendors list.
 - 3. Contractor shall ensure that Vendor receives the latest issues of revised drawings and/or specifications.
 - 4. Prior to ordering products from Vendor, Contractor shall verify that Vendor has received that latest set of revised drawings and/or specifications. Any modifications, replacements and additions required to products due to failure to keep Vendor informed shall be the responsibility of the Contractor and shall be supplied or performed at no additional cost to owner and/or Academy.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: A free standing, dead-front type low-voltage distribution switchboard 480/277V, 800A manufactured by Square-D and supplied through Academy preferred vendor.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store switchboards according to NECA 400.
- B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.
- C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ensure that concrete encased grounding electrodes have been provided and coordinated with Switchboard footprint.
- B. Ensure that underground service entrance conduits have been provided and coordinated with Switchboard footprint.

3.3 INSTALLATION

- A. Install switchboards and accessories according to NECA 400.
- B. Equipment Mounting: Install switchboards on concrete base, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Division 03 Section "Cast-in-Place Concrete".
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to switchboards.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.
- D. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- F. Install filler plates in unused spaces of panel-mounted sections.

- G. Install overcurrent protective devices, surge protective devices, and instrumentation.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- H. Comply with NECA 1.
- I. Check terminations and re-torque per manufacturer's instructions.
- J. Installation and termination of electrical service entrance.
- K. Installation and termination of "Field Installed" feeder wiring as indicated on Drawings.
- L. Installation and termination of branch circuit wiring including power, lighting and other controlled load circuits.
- M. Installation of grounding electrodes and grounding electrode conductors as indicated on Drawings.
- N. Terminate grounding electrode and equipment grounding conductors to grounding electrode(s).

3.4 ELECTRICAL SERVICE

- A. Perform Work in strict compliance with the local utility's requirements.

3.5 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Division 26 Section Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems.
- C. Device Nameplates: Label each disconnecting, and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Switchboard will be considered defective if it does not pass tests and inspections.

3.7 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

3.8 PROTECTION

- A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

END OF SECTION 262413.21

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Refer to Section 002213 Supplementary Instructions to Bidders, Items Furnished by Owner and comply with all requirements including use of Forms A – Forms E.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- C. Panelboards are furnished through Academy preferred Vendor.
- D. Panelboards shall be installed by Contractor or come installed as part of the integrated facility switchboard per specification section 262413.21.

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.
- B. SPD: Surge protective device.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1.5 INFORMATIONAL SUBMITTALS

- A. Panelboard schedules for installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

- 1. Panelboard Warranty Period: 60 months from date of Substantial Completion.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations:

- 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).
 - b. Altitude: Not exceeding 6600 feet (2000 m).

- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

- 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet (2000 m).

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407.

1.10 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.11 SEQUENCING AND SCHEDULING

- A. The responsibility of Work under this Section includes, but is not limited to, the following:

1. Contact the Owner's Electrical Equipment Supplier to coordinate and schedule delivery to site.
2. Refer to drawings and specifications for a list of Owner's preferred Vendors and Contractors. If not listed on the Drawings, contact the Owner for a preferred Vendors list.
3. Contractor shall ensure that Vendor receives the latest issue of revised drawings and/or specifications as soon as they are in the possession of the Contractor.
4. Prior to ordering products from Vendor, Contractor shall verify that Vendor has received that latest set of revised drawings and/or specifications. Any modifications, replacements and additions required to products due to failure to keep Vendor informed shall be the responsibility of the Contractor and shall be supplied or performed at no additional cost to owner and/or Academy.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NECA 407.
- C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box. Mount panelboard cabinet plumb and rigid without distortion of box.
- E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- H. Install filler plates in unused spaces.
- I. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Isolated-ground receptacles.
4. Tamper-resistant receptacles.
5. Weather-resistant receptacles.
6. Snap switches and wall-box dimmers.
7. Wall-switch and exterior occupancy sensors.
8. Pendant cord-connector devices.
9. Cord and plug sets.
10. Service power poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. SPD: Surge Protection Device.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

- A. General: Submit the following in accordance with Division 01 and Division 26 Section "General Electrical Requirements".

- B. Product data for the following products:
 - 1. Provide manufacturer's catalog information specifically marked to indicate which devices are being furnished, and showing dimensions, colors, and configurations for all devices, including, but not limited to: Receptacles, AC wall switches, emergency shunt relays, cover plates, power poles, and multi-outlet assemblies.
- C. Warranty: Special warranties specified in this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Materials shall be manufactured by companies that have been specializing in the products specified in this Section, for a minimum of 10 years.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - 2. Hubbell Incorporated; Wiring Device-Kellems.
 - 3. Leviton Manufacturing Co., Inc.
 - 4. Pass & Seymour/Legrand (Pass & Seymour).
- C. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.
- D. The catalog numbers listed in the following articles are generally for 20A rated devices. Where 15A rated devices are indicated on the Drawings or required for circuit rating limitations, provide receptacles equivalent to those specified for 20A, but rated for 15A.
- E. Manufacturer's model numbers listed are to establish the quality of the wiring devices. Coordinate the proper suffixes in order to provide the correct color as specified above.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
- B. Duplex convenience receptacles: Specification grade, 125 V, 20 A UL listed and labeled, smooth nylon face, side and back wired, self-grounding.
 - 1. Cooper; 5351 (single), CR5352 (duplex).
 - 2. Hubbell; HBL5361 (single), HBL5352A (duplex).
 - 3. Leviton; 5891 (single), 5352 (duplex).
 - 4. Pass & Seymour; 5361 (single), 5352 (duplex).
- C. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
 - a. Cooper; IG5362.
 - b. Hubbell; CR5352IG.
 - c. Leviton; 5362-IG.
 - d. Pass & Seymour; IG6300.
- D. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

2.4 GFCI RECEPTACLES

- A. General Description:
 - 1. Straight blade, feed-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
 - a. Cooper; GF20.
 - b. Hubbell; GF20LA
 - c. Leviton; 6898.
 - d. Pass & Seymour; 2091-S.

2.5 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
- B. Twist-locking type receptacles: NEMA L5020R, 125V, 20A, grounding type, UL listed and labeled, nylon face, side and back wired, self-grounding.

1. Cooper; L520R (single).
2. Hubbell; HBL2310 (single).
3. Leviton; 2310 (single).
4. Pass & Seymour; L520-R (single).

C. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Description:
 - a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
 - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.7 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

1. Switches:
 - a. Single Pole
 - 1) Cooper; 2221.
 - 2) Hubbell; 1221.
 - 3) Leviton; 1221-2.

4) Pass & Seymour; 20AC1.

b. Two Pole:

- 1) Cooper; 2222.
- 2) Hubbell; 1222.
- 3) Leviton; 1222-2.
- 4) Pass & Seymour; 20AC2.

c. Three Way:

- 1) Cooper; 2223.
- 2) Hubbell; 1223.
- 3) Leviton; 1223-2.
- 4) Pass & Seymour; 20AC3.

d. Four Way:

- 1) Cooper; 2224.
- 2) Hubbell; 1224.
- 3) Leviton; 1224-2.
- 4) Pass & Seymour; 20AC4.

2.9 WALL-BOX DIMMERS

- A. Wall box dimmers: (For use only in a Golf Hitting Room) Rotary dimmers, UL listed and labeled, with Radio Frequency Interference (RFI) filters to avoid interference with electronic equipment, and a minimum wattage of 1500 VA @277V. Leviton IllumaTech IP710-DL.

2.10 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
5. Masonry walls and oversized wall openings: Jumbo size galvanized steel plates.

- B. Damp Location Weatherproof Receptacle Cover Plates: UL-listed Wet Location (cover closed, not in use); die-cast, gasketed (factory-installed) self-closing covers, for horizontal or vertical mounting.

1. Manufacturer:

- a. Cooper; 1966 (horizontal), 966 (vertical).
- b. Hubbell; RW51020 (horizontal), RW51040 (vertical).
- c. Leviton; 4990 (horizontal), 4978 (vertical).
- d. Pass & Seymour; 4511 (horizontal), 4504 (vertical).

- C. Wet Location Weatherproof Receptacle Cover Plates: NEMA 3R weather resistant recessed or flush mount, die cast aluminum lockable cover. Configure cover for horizontal or vertical mounting of receptacle. Back box must be suitable for conduit connections. Coordinate back box with wall depth.

1. Manufacturer:

- a. Intermatic; WP1000HRC (horizontal), WP1000RC (vertical).
- b. Hubbell; RW57500.

- D. Weatherproof switch cover plates: Fabricated of cast aluminum or cast zinc, sealed water-tight and UL listed for wet locations.

1. 1-Gang:

- a. Appleton; FSK.
- b. Raco; 5100 Series.
- c. Steel City; SW Series.

2.11 PREFABRICATED MULTIOUTLET ASSEMBLIES

A. Description:

- 1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
- 2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- 3. Provide all fittings, devices, end closures, elbows, boxes and conduit entrance fittings as required for a complete installation.

B. Raceway Material: Extruded Aluminum.

- 1. Hubbell HBL ALU20 Series

C. Multi-outlet Harness:

- 1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
- 2. Receptacle Spacing: 18 inches unless noted otherwise.
- 3. Wiring: No. 12 AWG solid, Type THHN copper, single circuit.
- 4. Device color: Gray

2.12 SERVICE POLES

A. Description:

- 1. Service/Power Poles: Steel raceway, internal barrier to separate power conductors from communications cables, ceiling trim plate, carpet/tile floor plate as required for floor material. Power poles shall be of lengths specified on the drawing. Refer to plans and details for complete information.
- 2. Manufacturer: D and P Custom Lights.

3. Model is customized for Academy.
4. Refer to Vendor list for ordering information.

2.13 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: Gray unless otherwise indicated or required by NFPA 70 or device listing. Cover plates: for plastic covers, match device color.
2. Isolated-Ground Receptacles: Orange with orange cover plate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install wiring devices after all wall preparation, including painting, is complete.
4. Outlets are only approximately located on the small-scale Drawings. Use great care in the actual location by consulting the various large scale detailed Drawings used by other Division trades, and by securing definite locations from the Architect / Owner.
5. Do not use multi-conductor circuits, with a shared neutral, for any GFCI receptacle circuit. Provide a separate neutral conductor with all GFCI receptacle circuits.
6. Provide special type receptacles where indicated on the Drawings.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.

- b. Straighten conductors that remain and remove corrosion and foreign matter.
- c. Pigtail existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
10. Connect wiring device grounding terminal to branch circuit equipment grounding conductor and bond to metal outlet box. Exception: Do not bond grounding terminals of isolated ground receptacles to the outlet box.
11. Install all wiring devices plumb, level, and square with building lines. Wiring device bodies shall extend to the finished surface of the walls, ceiling, or floor, as applicable, without projecting beyond them.
12. Install switches with OFF position down.
13. Unless dimensioned otherwise, install wiring devices a minimum of 24 inches from the closest edge of any sink.
14. Where dimmer switches are shown adjacent to standard switches, install both in separate back boxes with adequate space between so that neither cover plate requires cutting. Dimmers shall not require de-rating. Do not remove fins.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

F. Device Plates:

1. Do not use oversized or extra-deep plates.
2. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
3. Install cover plates on all switches, receptacles, and blank outlets.
4. Locate wiring devices so that the cover plate does not have to be cut to be installed.

5. Install cover plates after the wall has been finished (painted, wallpaper, etc.).
6. Where devices are shown near wall openings, coordinate location if corner guards are to be installed so that cover plates do not require cutting.
7. Install device boxes in brick or block walls such that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

3.2 MOUNTING HEIGHTS

A. Coordinate locations of outlet boxes provided under Division 26 Section "Common Work Results for Electrical".

B. Unless noted otherwise, install wiring devices as indicated below (NOTE: All dimensions are to the BOTTOM of the outlet box unless noted otherwise):

1. Receptacles:

a. General:

- 1) Vertically with the ground slot mounted at the top: 16 inches above finished floor.
- 2) Horizontally, with neutral slot mounted at the top: 16 inches above finished floor.

b. Above counters:

- 1) For 36-inch-high counter tops: 44 inches above finished floor, vertically.
- 2) For 34-inch-high counter tops: 40 inches above finished floor, vertically.

- c. Mechanical and electrical equipment rooms and janitors' closets: 44 inches above finished floor, vertically.
- d. Weatherproof exterior receptacles: 24 inches above finished grade or as indicated on Drawings, horizontally.
- e. GFCI receptacles: Same as general receptacles.
- f. Isolated ground receptacles: Same as general receptacles.
- g. Concrete Block Walls: Dimensions above may be adjusted slightly, as required to compensate for variable joint dimensions, such that bottom or top of boxes, as applicable, are at block joints.

2. Switches:

- a. General: 44 inches above finished floor.
- b. Above counters: Same as for receptacles.
- c. Concrete Block Walls: 40 inches above finished floor (dimension may be adjusted slightly, as required to compensate for variable joint dimensions, such that bottom of boxes are at block joints).
- d. Walls with wainscoting: 6 inches minimum above wainscoting, but not exceeding 48 inches above finished floor.

3. Multi-outlet assemblies: As indicated in Drawings.

4. Telephone/Data Outlet Boxes:

- a. General: Match mounting height of adjacent wiring device listed above.
- b. Wall-mounted telephone: 40 inches above finished floor.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle and switch with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.6 CLEANING

- A. Clean exposed surfaces to remove splatters and restore finish.

3.7 MILLWORK INSTALLATION FROM ACADEMY

(Dressing Room-IDF, Cash Wraps, Cash Out Booth, Managers Booth, Customer Service Counter, Hunt/Fish counter)

Number of days
after Mill Work
install begins

Time line is based on an ideal install of 4 days, day shift work were all materials arrive on time. If multiple shifts are worked or number of days change, the time line may vary but order of install and electrical work should remain the same.

(Store Fixture
Setup Date)

IT Cable Contractor: Store Pre-Wire begins (Speakers, CCTV, AP's, Main cable runs)

Mill Work Installers:

- Dressing Room and IDF build begins
- Cash Wrap installs begin and should complete
- If enough installer crews, then Cash Out and Manager booth, Customer Service, Hunt/Fish counters installs begin in order listed

1

Electricians:

- Morning: If not already complete, prepare data/power poles for cash wraps, booths and counters
- Afternoon: Begin installing data/power poles at Cash Wraps as each install completes

Mill Work Installers:

- Morning: If not already completed, Cash Wrap installs complete
- Afternoon: Dressing Room and IDF build completes
- If not already started, Cash Out and Manager booth, Customer Service, Hunt/Fish counters install begins in order listed

Electricians:

- Morning: If not already started, begin installing data/power poles at Cash Wraps
- Afternoon: Once IDF walls are secure, install 3 data cable conduits in IDF, install 3 IG electrical circuits and dedicated ground in the IDF, in order listed. Then continue installing data/power poles at cash wraps

2

IT Cable Contractor:

- Afternoon: Begin dropping cables down data/power poles at the Cash Wraps

Mill Work Installers:

- Cash Out and Manager booth, Customer Service, Hunt/Fish counters install continues in order listed

Electricians:

- Morning: If the 3 data cable conduits and other electrical work is not complete in IDF during afternoon of day 2, then this is a priority to complete the morning of day 3
- If not already complete, the Cash Wrap data/power poles installs complete
- Begin standing data/power poles at Cash Out and Managers booth and other counters as Mill Work installs complete

3

IT Cable Contractor:

- Finishes dropping cables down data/power poles at Cash Wraps and begin work inside the IDF

Mill Work Installers:

- Cash Out and Manager Booth, Customer Service, Hunt/Fish counters installs should be completing

Electricians:

- Should be completing data/power pole installs at all booths and counters as Mill Work install completes

4+

IT Cable Contractor:

- Begin dropping cables down data/power poles as electricians finish installs at all booths and counters

Electricians:

- Once end caps are set, install Data conduit and power for Price Checkers
- During and after Mill Work install, make hot all electrical in IDF, Cash Wraps, Cash Out and Manager Booths, Customer Service Counter, Hunt/Fish Counter, Price Checker end caps5, 6, 7

5,6,7

IT Cable Contractor:

- Before, during and after the Mill Work install, IT cabling to non-mill work related areas will be taking place (BOH, Receiving, Support Columns, Ceiling)

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Refer to Section 002213 Supplementary Instructions to Bidders, Items Furnished by Owner and comply with all requirements including use of Forms A – Forms E.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Enclosed switches.
 - 2. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 3. Current-limitation curves for fuses with current-limiting characteristics.

1.4 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Spare Fuse Cabinet: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 - 2. Finish: Gray, baked enamel.
 - 3. Identification: "SPARE FUSES" in 1-1/2-inch-high letters on exterior of door.

4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.
 5. Install spare-fuse cabinet(s) in main electrical room.
- C. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Cooper Bussmann; a division of Cooper Industries.
 2. Ferraz Shwamut, Inc.
 3. Littelfuse, Inc.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
 2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.3 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

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**SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS
(EQUIPMENT FURNISHED BY ACADEMY PREFERRED VENDOR)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Refer to Section 002213 Supplementary Instructions to Bidders, Items Furnished by Academy preferred Vendor and comply with all requirements including use of Forms A – Forms E.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Non-fusible switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Molded-case switches.
 - 5. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of NRTL listing for series rating of installed devices.

5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
- C. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or of an NRTL.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.10 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.11 SEQUENCING AND SCHEDULING

- A. The responsibility of Work under this Section includes, but is not limited to, the following:
 1. Contact the Owner's Electrical Equipment Supplier to coordinate and schedule delivery to site.
 2. Refer to drawings and specifications for a list of Owner's preferred Vendors and Contractors. If not listed on the Drawings, contact the Owner for a preferred Vendors list.
 3. Contractor shall ensure that Vendor receives the latest issue of revised drawings and/or specifications as soon as they are in the possession of the Contractor.
 4. Prior to ordering products from Vendor, Contractor shall verify that Vendor has received that latest set of revised drawings and/or specifications. Any modifications, replacements and additions required to products due to failure to keep Vendor informed shall be the responsibility of the Contractor and shall be supplied or performed at no additional cost to owner and/or Academy.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Schneider Electric: Square D supplied through Academy preferred vendor.
 2. Eaton Electrical Inc.: Cutler-Hammer Business Unit supplied through Academy preferred vendor.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Schneider Electric: Square D supplied through Academy preferred vendor.
 2. Eaton Electrical Inc.: Cutler-Hammer Business Unit supplied through Academy preferred vendor.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Schneider Electric: Square D supplied through Academy preferred vendor.
 - 2. Eaton Electrical Inc.: Cutler-Hammer Business Unit supplied through Academy preferred vendor.

2.4 ENCLOSURES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Schneider Electric: Square D supplied through Academy preferred vendor.
 - 2. Eaton Electrical Inc.: Cutler-Hammer Business Unit supplied through Academy preferred vendor.
- B. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.

- E. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

END OF SECTION 262816

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SECTION 265100 - INTERIOR LIGHTING
(EQUIPMENT FURNISHED BY ACADEMY PREFERRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. Refer to Section 002213 Supplementary Instructions to Bidders, "Items Furnished by Owner" and comply with all requirements including use of Forms A – E.
- B. Section Includes:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.
- C. All interior light fixtures, lamps and suspension cables are furnished by Owner, installed by Contractor.
- D. Related Sections:
 - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
 - 2. Section 262726 "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

1.4 SEQUENCING AND SCHEDULING

- A. The responsibility of Work under this Section includes, but is not limited to, the following:
 - 1. Contact the Owner's Electrical Equipment Supplier to coordinate and schedule delivery to site.

2. Refer to drawings and specifications for a list of Owner's preferred Vendors and Contractors. If not listed on the Drawings, contact the Owner for a preferred Vendors list.
3. Contractor shall ensure that Vendor receives the latest issues of revised drawings and/or specifications.
4. Prior to ordering products from Vendor, Contractor shall verify that Vendor has received that latest set of revised drawings and/or specifications. Any modifications, replacements and additions required to products due to failure to keep Vendor informed shall be the responsibility of the Contractor and shall be supplied or performed at no additional cost to owner and/or Academy.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Protection: Provide facilities for handling and storage of materials to prevent damage to edges, ends, and surfaces. Keep materials dry and protected from weather. Fixtures stored outside without a permanent overhead roof and shelter shall be replaced at Contractor expense. Examples of approved storage include drop trailers, store inside warehouse, or other Owner Construction Manager approved storage area meeting. Fixtures showing signs of rust or weathering shall be replaced at Contractor's expense.
- B. Contact vendor at least 4 weeks prior to desired delivery date to arrange for delivery of lighting fixtures.

PART 2 - PRODUCTS

2.1 VENDOR FURNISHED PRODUCTS

- A. Academy's Lighting Vendor will furnish lighting fixtures, lamps as indicated on Drawings, for installation by Contractor.
- B. No substitutions are allowed without prior approval from Academy and Engineer.

2.2 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports, and nonmetallic channel and angle supports.
- B. Coordinate installation of hanger and supports with mounting hardware provided with lights fixture package.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Remote Mounting of Ballasts: Distance between the ballast and luminaire shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.
- C. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- D. Install lamps in each luminaire.
- E. Coordinate layout and installation of luminaires and suspension system with other construction that penetrates ceilings or is supported by them.
- F. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and re-lamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- G. Ceiling-Grid-Mounted Luminaire Supports: Use grid as a support element.
 - 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each luminaire. Locate not more than 6 inches from luminaire corners.
 - 2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.
 - 3. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
 - 4. Install at least one independent support rod or wire from structure to a tab on luminaire. Wire or rod shall have breaking strength of the luminaire weight at a safety factor of 3.
- H. Flush-Mounted Luminaire Support:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.

I. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.
3. Unless otherwise noted, conceal all raceways and back boxes for wall mounted light fixtures. Coordinate all wall-mounted light fixtures with interior elevations. Where specific elevations or dimensions are not indicated, verify the correct location with Architect prior to installation. Contractor shall supply structure to support weight of fixture.

J. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end. Provide suitable connectors or collars to connect adjoining units to appear as a continuous unit.
4. Manufacturers of decorative pendant-mounted fixtures shall provide flexible, field cutting cords. Contractor shall field cut cords to match elevations above finished floor as indicated on architectural elevations. Contractor shall not field cut pendants without elevation approval from Architect. Pendant suspensions on electrical documents are for reference only.
5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

L. Through wiring of recessed light fixtures, in suspended ceilings, is not permitted. Connect each light fixture by a whip to a junction box. The whip shall be of sufficient length to allow the light fixture to be relocated within a 6-foot radius.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

B. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- C. Clean light fixtures of dirt and debris upon completion of the installation. Protect installed light fixtures from damage during the remainder of the construction period.
- D. Upon completion of the installation of light fixtures, and after the building circuits have been energized, energize lighting branch circuits to demonstrate capability and compliance with the requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance, otherwise remove and replace with new units and proceed with retesting.
- E. At the time of final acceptance of the project by the Owner, ensure that all lamps are in working order and all light fixtures are fully lamped.
- F. Luminaire will be considered defective if it does not pass operation tests and inspections.
- G. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.5 COORDINATION

- A. Light fixtures shown on the Electrical Drawings represent general arrangements only. Refer to Architectural Drawings for exact locations.
- B. Coordinate the installation and location of light fixtures with other work and all other trades before installation to avoid conflicts. Coordinate light fixture locations in mechanical rooms with final installed piping and ductwork layouts.
- C. Verify all ceiling systems and coordinate light fixture type and accessories prior to ordering light fixtures. Coordinate and cooperate with ceiling installer in regards to the location and installation of light fixtures.
- D. Wall-Mounted Light Fixtures
 1. Coordinate all wall-mounted light fixtures with the architectural features of the building. Where specific elevations or dimensions are not indicated, verify the correct location with the Architect prior to beginning any work.

3.6 ADJUSTING

- A. Contractor shall adjust all light fixture sockets to match the lamp specified and aim all adjustable light fixtures as directed by the Architect.
- B. At the time of substantial completion, aim all track lights, flood lights, spotlights, and other fixtures requiring aiming per the Architect's direction. Contractor shall make provisions for supplying all scaffolds, lifts, and other tools and equipment as required.

- C. Where required, focusing shall be done during hours of darkness. Upon notification by contractor that all fixtures are correct as per shop drawings and functioning, that specified lamps have been verified, lighting designer or Architect shall coordinate with contractor as to a mutually agreed upon time to complete focusing. Failure of contractor to notify Architect during substantial completion will result in failure to comply with specifications.
- D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
 - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
 - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 3. Adjust the aim of luminaires in the presence of the Architect.

3.7 STARTUP SERVICE

- A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed for at least 100 hours at full voltage.

END OF SECTION 265100

SECTION 265600 - EXTERIOR LIGHTING
(EQUIPMENT FURNISHED BY ACADEMY PREFERRED VENDOR)

PART 1 - GENERAL

1.1 SUMMARY

- A. Refer to Section 002213 Supplementary Instructions to Bidders, "Items Furnished by Owner" and comply with all requirements including use of Forms A – E.
- B. Section Includes:
 - 1. Exterior luminaires with lamps and ballasts.
 - 2. Poles and accessories.

1.2 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

- A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.
- B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.
- C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.
- D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.
 - 1. Basic wind speed (3-second gust) for calculating wind load for poles 50 feet high or less is **<Insert value from AASHTO LTS-4-M for this Project>**.
 - a. Wind Importance Factor: **[1.0] <Insert value>**.
 - b. Minimum Design Life: **[25 years] <Insert value>**.
 - c. Velocity Conversion Factors: **[1.0] <Insert value>**.

1.3 SUBMITTALS

- A. General:
 - 1. Submit all light fixtures, specified for use on this project, in a single submittal package of portfolios, so that all light fixtures can be reviewed at one time.
 - 2. Prepare portfolios from manufacturer's standard specification sheets, and include the number indicated on the Light Fixture Schedule to identify each light fixture. Do not combine more than one light fixture type on a single sheet.
- B. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes and the following
 - 1. Name of manufacturer

2. Descriptive cut sheets providing physical description of light fixture, including materials, dimensions, effective projected area, and verification of indicated parameter.
 3. Fixture efficacy.
 4. Coefficient of utilization tables.
 5. Light fixture voltage.
 6. The number, type and wattage of the light fixture lamps (including cut sheets).
 7. Lens type
 8. Light fixture options that are to be provided.
 9. Light fixture mounting details.
 10. Construction of light fixture housing and door (if applicable).
 11. Light fixture ballast manufacturer, number and type per light fixture.
 12. Light fixture finish and color (if applicable).
 13. Life, output and energy-efficiency data for lamps. Energy data shall comply with IESNA LM-47.
 14. Details of attaching light fixtures and accessories.
 15. Details of installation and construction.
 16. Light fixture materials.
 17. Photometric data based on laboratory tests of each light fixture type, complete with indicated lamps, ballasts and accessories.
 - a. For indicated light fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining light fixtures shall be certified by manufacturer.
 - b. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Light Products.
 18. Ballasts, including energy-efficiency data.
 19. Lamps, including life, output and energy-efficiency data.
 20. Materials, dimensions and finishes of poles.
 21. Means of attaching light fixtures to supports, and indication that attachment is suitable for components involved.
 22. Anchor bolts for poles.
 23. Manufactured pole foundations.
- C. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.
- D. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4 or as noted elsewhere in this specification and that loads imposed by light fixtures have been included in design.
- E. Operation and Maintenance Data: For light fixtures and poles to include in operation and maintenance manuals.
- F. Warranty: Special warranties specified in this section.

1.4 DEFINITIONS

- A. BF: Ballast factor.
- B. CRI: Color-rendering index.
- C. CU: Coefficient of utilization.
- D. Delegated-Design Submittals: Documents, including drawings, calculations, and material and product specifications prepared as a responsibility of Contractor to obtain acceptance by Owner and authorities having jurisdiction.
- E. HID: High-intensity discharge.
- F. Horizontal Illuminance: Measurement in foot-candles (lux), on a horizontal surface 36 inches above the ground, unless otherwise indicated.
- G. LER: Light fixture efficacy rating.
- H. Light fixture: Complete light fixture, including ballast housing if provided.
- I. LLD: Lamp Lumen Depreciation.
- J. LLF: Light Loss Factor.
- K. Luminaire: Complete lighting fixture, including ballast housing if provided.
- L. Pole: Light fixture support structure, including tower used for large area illumination.
- M. Standard: Same definition as "Pole" above.
- N. Target Illumination: Average maintained illumination level, calculated by multiplying initial illuminance by LLF.
- O. UG: Uniformity Gradient; the rate of change of illuminance over a lighted area, expressed as a ration between the illuminances of adjacent measuring points on a uniform grid.
- P. Vertical Illuminance: Measurement in foot-candles (lux), in two directions on a vertical surface, at an elevation coinciding with plane height of horizontal measurements.

1.5 QUALITY ASSURANCE

- A. Light Fixture Photometric Data Testing Laboratory Qualifications: Provided by manufactures' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Light Fixture Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authority having jurisdiction, and marked for intended use.
- D. Comply with IEEE C2, "National Electrical Safety Code."
- E. Comply with NFPA 70.

1.6 COORDINATION

- A. Unless otherwise noted, perform all electrical Work required for the proper installation and operation of equipment, furnishings, devices, and systems specified in other Divisions of these Specifications, furnished under other contracts, and/or furnished by the Owner for installation under this Contract.
- B. Coordinate layout and installation of light fixtures, poles, foundations, and underground raceway system with other above-and below-grade site construction and utilities. Notify Architect/Engineer of conflicts before proceeding with the Work.

1.7 WARRANTY

- A. Special Warranty Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 - 1. Warranty Period for Light fixtures: Free from defects in materials and workmanship (excluding fuses and lamps) for a period of Five years from date of Substantial Completion.
 - 2. Warranty Period for Metal Corrosion: Free from defects in materials and workmanship for a period of Five years from date of Substantial Completion.
 - 3. Warranty Period for Color Retention: Free of fading for a period of Five years from date of Substantial Completion.
 - 4. Warranty Period for Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.
 - 5. Warranty Period for Poles: Repair or replace light poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.
 - 6. Alignment Warranty: Accuracy of alignment of light fixtures shall remain within specified illuminance uniformity ratios for a period of five years from date of successful completion of acceptance tests. Realign fixtures that become misaligned during the warranty period. Replace alignment products that fail within the warranty period. Retest distribution to verify proper realignment.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Store poles on decay-resistant treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- B. Retain factory-applied pole wrappings on metal poles until right before pole installation.
- C. Handle all poles with web fabric straps.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
 2. Specular Surfaces: 83 percent.
 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected from manufacturer's standard catalog of colors.
 - b. Color: As selected by Architect from manufacturer's full range.

2.3 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4-M.
1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3..
 2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
1. Materials: Shall not cause galvanic action at contact points.
 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
 3. Anchor-Bolt Template: Plywood or steel.
- D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws. Provide on all, except wood poles.

- E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

2.4 ALUMINUM POLES

- A. Poles: One-piece construction up to 40 feet in height with access handhole in pole wall.
 - 1. Shape: Round, tapered.
 - 2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- B. Brackets for Luminaires: Detachable, cantilever, without underbrace.
 - 1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with galvanized-steel bolts.
 - 2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
 - 3. Match pole material and finish.
- C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- D. Intermediate Handhole and Cable Support: Weathertight, 3-by-5-inch handhole located at midpoint of pole with cover for access to internal welded attachment lug for electric cable support grip.
- E. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- F. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.
- G. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- H. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.
- I. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."
 - 2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.

3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify conditions of equipment and installation prior to beginning work.
- B. Verify that equipment is ready for connecting, wiring and energizing.

3.2 LIGHT FIXTURE INSTALLATION

- A. Fasten luminaire to indicated structural supports.
 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- B. Adjust luminaires that require field adjustment or aiming. Baffles and Louvers for Spill Light Correction: Install on lighting fixtures with fasteners provided by the manufacturer. Install and adjust to correct out-of-limit spill-light measurements.
- C. Install controls and remote ballast housings in cabinets mounted on support structure at least 10 feet above finish grade.

3.3 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
 1. Fire Hydrants and Storm Drainage Piping: 60 inches.
 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
 3. Trees: 15 feet from tree trunk.
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."
- D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level recommended by pole manufacturer.
 1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
 2. Grout void between pole base and foundation. Use non-shrink or expanding concrete grout firmly packed to fill space.
 3. Install base covers unless otherwise indicated.

4. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
 - E. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.
 - F. Raise and set poles using web fabric slings (not chain or cable).
- 3.4 CORROSION PREVENTION
- A. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.
- 3.5 GROUNDING
- A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
 1. Install grounding electrode for each pole unless otherwise indicated.
 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- 3.6 FIELD QUALITY CONTROL
- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
 - B. Adjust all light fixture sockets to match the lamp specified and aim all adjustable light fixtures as directed by the Architect.
 - C. Upon completion of the installation of light fixtures, and after building circuits have been energized, apply electrical energy to demonstrate capability and compliance with the requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
 - D. Clean light fixtures of dirt and debris upon completion of the installation. Protect installed light fixtures from damage during the remainder of the construction period.
 - E. At the time of Substantial Completion, aim all adjustable fixtures, such as flood and spotlights, per the Architect's direction. Provide all necessary equipment to support this effort, such as scaffolds and lifts, as required.
 - F. At the time of Final Acceptance of this Project by the Owner, all lamps shall be in working order and all light fixtures shall be fully lamped.
 - G. Illumination Observations: Verify normal operation of lighting units after installing light fixtures and energizing circuits with normal power source.

END OF SECTION 265600

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SECTION 266100 - TESTING REQUIREMENTS AND COMPLETION FORM

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORMED AND PASSED
260010.3.11.C1	Building service entrance voltage and amperes at each phase	Electrical Contractor	
260010.3.11.C2	Electrical service grounding conditions and grounding resistance	Electrical Contractor	
260010.3.11.C3	Proper phasing throughout the entire system	Electrical Contractor	
260526.3.7.A2	Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the fall-of-potential method according to IEEE 81	Electrical Contractor	
260526.3.7.A3	Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results	Electrical Contractor	
260923.3.5.A	Inspect installed equipment, wiring, components, and connections	Electrical Contractor	
260923.3.5.C	Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest	Electrical Contractor	
262726.3.7.C	Verify that each receptacle device is energized. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements	Electrical Contractor	
262726.3.7.E	Test each GFCI receptacle device for proper operation	Electrical Contractor	
265100.3.5.A	Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal	Electrical Contractor	
265100.3.5.C	Upon completion of the installation of light fixtures, and after building circuits have been energized, energize lighting branch circuits to demonstrate capability and compliance with the requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate	Electrical Contractor	

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORM ED AND PASSED
	compliance; otherwise, remove and replace with new units, and proceed with retesting		
265100.3.5.E	Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards	Electrical Contractor	
265100.3.6.A	Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage	Electrical Contractor	



Ready for Freedom Checklist

TO: Nick Roth – NexRev Program Manager FAX: (972) 578-0175
FROM: _____ DATE: _____
JOB NAME: _____ ADDRESS: _____

Scheduled Date(s) For Freedom Services: _____

To ensure that the building is ready for the Freedom install on the scheduled date(s) above, please verify that the following items are complete:

1. HVAC units have low voltage sleeves installed?	☐ YES ☐ NO When? _____
2. RTUs are powered and operational?	☐ YES ☐ NO When? _____
3. Main service to building installed?	☐ YES ☐ NO When? _____
4. Power Meter & CTs Installed?	☐ YES ☐ NO When? _____
5. Low voltage wire ran to all lighting rails in electrical panels?	☐ YES ☐ NO When? _____
6. Conduit for all HVAC sensors ran to correct locations?	☐ YES ☐ NO When? _____
7. 2 Gang cut in box installed in managers office for override installed?	☐ YES ☐ NO When? _____
8. Two ¾ in conduit into MDP for low voltage wire installed?	☐ YES ☐ NO When? _____
9. Is the circuit powering our Freedom panel pulled to its location?	☐ YES ☐ NO When? _____
10. Sales lighting and fixtures installed and powered up	☐ YES ☐ NO When? _____
11. All low voltage wires pulled from fixtures to dimming panel and labeled?	☐ YES ☐ NO When? _____
12. Sign and parking lot fixtures installed and powered up?	☐ YES ☐ NO When? _____
13. Sensors on site from the HVAC contractor (humidity sensors)?	☐ YES ☐ NO When? _____
14. Site is ready for full commissioning of Controls to all units and lighting?	☐ YES ☐ NO When? _____

THE GENERAL CONTRACTOR MUST SIGN AND RETURN THIS COMPLETED CHECKLIST TO NEXREV AFTER CONFIRMING THAT THE BUILDING IS READY FOR THE FREEDOM INSTALL PER THE CHECKLIST ABOVE.

General Contractor Printed Name: _____ Date: _____

General Contractor Signature: _____

General Contractor Contact Number: _____

NOTE: This form must be faxed to NexRev at least seven (7) days prior to the scheduled Freedom date(s) to prevent delays or additional charges for insufficient notice. If a site visit is scheduled and items listed above have not been completed at the time NexRev technicians arrive onsite, additional trip charges may apply to the contractor requesting the visit via this checklist.

601 Development Drive, Plano, TX 75074

(972) 578-0505 Fax (972) 578-0175

END OF SECTION 266100

Academy S and O – 55k Prototype
2025 Q3 Release 8-19-2025 –
Siloam Springs, AR

266100 - 3

TESTING REQUIREMENTS AND
COMPLETION FORM

SECTION 266200 - O & M REQUIREMENTS AND COMPLETION FORM

REFER TO SECTION #	O & M REQUIRED INFORMATION	DATE O & M MANUALS DELIVERED/TAS K COMPLETED
260010.1.11.B	Submit data prior to requesting the final punch list and before all requests for Substantial Completion	
260010.1.11.C	Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division	
260010.1.11.D	Prior to Substantial Completion of the project, furnish to the Architect, for Engineer's review, and for the Owner's use, four (4) copies of brochures in three-ring, loose-leaf, hard-back notebook form, divided and tabbed, containing equipment data, approved submittals, shop drawings, diagrams, capacities, spare part numbers, manufacturer's service and maintenance data, warranties, guarantees, etc. Include local contacts complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications	
262200.1.2.C	Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals	
262413.21.1.3.C	Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following: 1. Routine maintenance requirements for switchboards and all installed components 2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices 3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device	
262416.1.4.C	Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following: 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments	

262816.1.3.B	Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following: 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device	

265100.1.3.D	Operation and Maintenance Data: For lighting equipment and fixtures to include in operation and maintenance manuals	
265600.1.3.E	Operation and Maintenance Data: For light fixtures and poles to include in operation and maintenance manuals	

END OF SECTION 266200

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section and to all following sections within Division 28.

1.2 SUMMARY

- A. This Division requires providing complete functioning systems, and each element thereof, as specified, indicated, or reasonably inferred, on the Drawings and in these Specifications, including every article, device, or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the work include, but are not limited to, materials, labor, supervision supplies, tools, equipment, transportation, and utilities to accomplish the following general scope:
 - 1. Provide a complete and functioning Intrusion detection system.
- B. Contractor to coordinate delivery, receive & warranty Owner furnished items. The Contractor's warranty to include material & installation for a one-year term from store turn over.
- C. Drawings are graphic representations of the Work upon which the Contract is based. They show the materials and their relationship to one another, including sizes, shapes, locations, and connections. They also convey the scope of Work, indicating the intended general arrangement of the equipment, fixtures, outlets, and cabling without showing all of the exact details as to elevations, offsets, and other installation requirements. Use the Drawings as a guide when laying out the Work and to verify that materials and equipment will fit into the designated spaces, and which, when installed per manufacturers' requirements, will ensure a complete, coordinated, satisfactory and properly operating system.
- D. Specifications define the qualitative requirements for products, materials, and workmanship upon which the Contract is based.

1.3 ABBREVIATIONS

- A. ADA Americans with Disabilities Act
- B. AFF Above Finished Floor
- C. ANSI American National Standards Institute
- D. ASTM American Society for Testing and Materials

- E. BICSI Building Industry Consulting Service International
- F. CCTV Closed Circuit Television
- G. EIA Electronic Industries Alliance
- H. ESSC Electronic Safety and Security Contractor
- I. ETL Electrical Testing Laboratories, Inc.
- J. FCC Federal Communications Commission
- K. FM Factory Mutual
- L. GE Grounding Equalizer (Formerly the TBBIBC)
- M. IEEE Institute of Electrical and Electronic Engineers
- N. LED Light Emitting Diode
- O. NEC National Electric Code
- P. NESC National Electrical Safety Code
- Q. NEMA National Electrical Manufacturers Association
- R. NFPA National Fire Protection Association
- S. NRTL Nationally Recognized Testing Laboratory
- T. OEM Original Equipment Manufacturer
- U. OSHA Occupational Safety and Health Administration
- V. OSP OutSide Plant
- W. RCDD® Registered Communications Distribution Designer
- X. SCC Security Control Center
- Y. UL Underwriters Laboratories

1.4 DEFINITIONS:

- A. Whenever used in these Specifications or Drawings, the following terms shall have the indicated meanings:
 - 1. Furnish: "To supply and deliver to the project site, ready for unloading, unpacking, assembling, installing, and similar operations."

2. Install: "To perform all operations at the project site, including, but not limited to, and as required: unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, testing, commissioning, starting up and similar operations, complete, and ready for the intended use."
 3. Provide: "To furnish and install complete, and ready for the intended use."
 4. Furnished by Owner (or Owner-Furnished) or Furnished by Others: "An item furnished by the Owner or under other Divisions or Contracts, and installed under the requirements of this Division, complete, and ready for the intended use, including all items and services incidental to the Work necessary for proper installation and operation. Include the installation under the warranty required by this Division."
 5. Engineer: Where referenced in this Division, "Engineer" is the Design Professional for the Work under this Division, and is a Consultant to, and an authorized representative of, the Architect, as defined in the General and/or Supplementary Conditions. When used in this Division, it means increased involvement by, and obligations to, the Design Professional, in addition to involvement by, and obligations to, the "Architect".
 6. AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the Work.
 7. NRTL: Nationally Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA, etc.), and acceptable to the Authority having Jurisdiction (AHJ) over this project. Nationally Recognized Testing Laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other NRTL's that are acceptable to the AHJ, and standards that meet the specified criteria.
 8. AS DIRECTED means as directed by the Architect, or his representative.
 9. CONCEALED means embedded in masonry or other construction, installed behind wall furring or within drywall partitions, or installed within suspended ceilings.
 10. SUBMIT means submit to Architect for review.
 11. WET LOCATION means a pathway that does not protect cables from moisture levels that are beyond the intended operating range of "inside" premises cable.
 - a. For example: Slab-on-grade construction where pathways are installed underground or in concrete slabs that are in direct contact with soil (e.g., sand and gravel) is considered a "wet location."
 - b. Also refer to the:
 - 1) NEC, Article 100 for definitions of Location, Damp; Location, Dry; and Location, Wet.
 - 2) Telecommunications Distribution Methods Manual (TDMM) for definitions of Wet locations.
- B. The terms "approved equal", "equivalent", or "equal" are used synonymously and shall mean "accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified".
- C. The term "approved" shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

1.5 CODES, REFERENCES, AND STANDARDS

- A. The references to the following codes, references and standards are meant to represent the most current and up-to-date revisions or printing as of the issue of this document. The Contractor is responsible for following the correct revision or printing.
- B. Execute all Work in accordance with, and comply at a minimum with, National Fire Protection Association (NFPA) codes, state and local building codes, and all other applicable codes and ordinances in force, governing the particular class of Work involved, for performance, workmanship, equipment, and materials. Additionally, comply with rules and regulations of public utilities and municipal departments affected by connection of services. Where conflicts between various codes, ordinances, rules, and regulations exist, comply with the most stringent. Wherever requirements of these Specifications, Drawings, or both, exceed those of the above items, the requirements of these Specifications, Drawings, or both, shall govern. Code compliance, at a minimum, is mandatory. Construe nothing in these Construction Documents as permitting work not in compliance, at a minimum, with these codes. Bring all conflicts observed between codes, ordinances, rules, regulations and these documents to the Architect's and Engineer's attention in sufficient time, prior to the opening of Bids, to prepare the Supplementary Drawings and Specifications Addenda required to resolve the conflict.
- C. If the conflict is not reported timely, prior to the opening of bids, resolve the conflict and provide the installation in accordance with the governing codes and to the satisfaction of the Architect and Engineer, without additional compensation. Contractor will be held responsible for any violation of the law.
- D. Obtain timely inspections by the constituted authorities having jurisdiction; and, upon final completion of the Work, obtain and deliver to the Owner executed final certificates of acceptance from these authorities having jurisdiction.
- E. All material, manufacturing methods, handling, dimensions, methods of installation and test procedures shall conform to industry standards, acts, and codes, including, but not limited to the following, except where these Drawings and Specifications exceed them:
- F. NFPA 70 – National Electrical Code (NEC)
- G. NFPA 731 – Installation of Electronic Premises Security Systems
- H. National Electrical Safety Code (NESC)
- I. TIA/EIA TSB 140 – “Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems”

1.6 GUIDELINES

- A. NFPA 730 – Guide for Premises Security
- B. BICSI Electronic Safety and Security Design Reference Manual (ESSDRM)

1.7 QUALITY ASSURANCE

- A. Execute all Work under this Division in a thorough and professional manner by competent and experienced workmen duly trained to perform the Work specified.
- B. The ESSC shall submit information supporting compliance with the following minimum requirements.
 - 1. Minimum five (5) continuous years in the business of integrating and installing Electronic Safety and Security Systems incorporating systems and equipment including but not limited to intrusion detection, and video surveillance systems.
 - 2. Successful completion of at least three (3) facilities of similar size and scope that have been in operation for at least one (1) year. Successful completion shall be defined such that the project was not delayed by the completion of Electronic Safety and Security systems, Electronic Safety and Security systems were fully operational within 30 days of substantial completion requiring no further alteration, and Electronic Safety and Security systems remained fully operational at conclusion of warranty period.
- C. Personnel Qualifications:
 - 1. Where Video Surveillance is included within the security system scope of work, ESSC shall provide and maintain one of the following:
 - a. Provide and maintain a Project Manager whom is a Level III Video Security Systems Technician certified by National Institute for Certification in Engineering Technologies (NICET) in good standing. Project Manager must attend all scheduled project meetings and be on site at all times.
 - b. Provide and maintain a Project Manager whom is a Technician certified by the Video Surveillance Manufacturer for product being installed on the project and is in good standing. Project Manager must attend all scheduled project meetings.
 - 2. Provide and maintain a BICSI Registered RCDD in good standing on staff as a full-time employee at all times. This RCDD must be familiar with the project and available to attend all scheduled project meetings when required by the Owner/Engineer. Weekly inspections and approval of all work performed shall be conducted by this RCDD.
 - 3. Provide and maintain a Project Manager whom is a BICSI Registered Certified Technician Level Installer or NICET level III technician (audio, automation, or video) in good standing on site throughout the duration of the project. This project manager must attend all scheduled project meetings.
 - 4. Any additional personnel that will be physically installing any part of the Electronic Safety and Security System Infrastructure covered by this Division shall, at a minimum, be either a BICSI Certified Level 1 Commercial Installer in good standing or have a similar current and active certification by one of the conditionally approved list of vendors, and approved by the Engineer/Owner.
 - 5. These requirements are provided as a minimum level of qualification. Any additional or more stringent requirements by the specific manufacturer chosen to

provide the proper level or term of warranty as specified in this division must be met.

6. Alternate qualifications may be considered if requested alternates are provided in accordance with the substitution section herein.

- D. Install all Work in strict conformance with all manufacturers' requirements and recommendations unless these Documents exceed those requirements. Install all equipment and materials in a neat and professional manner, aligned, leveled, and adjusted for satisfactory operation, in accordance with BICSI guidelines.
- E. Unless indicated otherwise on the Drawings, provide all material and equipment new, of the best quality and design, free from defects and imperfections and with markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size, and capacity. Provide all material and equipment of the same type from the same manufacturer.
- F. Unless specified otherwise, manufactured items of the same types specified within this Division and intended for this project shall have been installed and proven at other facilities, without modification, renovation, or repair for not less than one year prior to date of bidding for this Project.
- G. Comply with the current applicable codes, ordinances, and regulations of the authority or authorities having jurisdiction, the rules, regulations, and requirements of the service providers serving the project and the Owner's insurance underwriter.
- H. Drawings, specifications, codes, and standards are minimum requirements. Where multiple requirements apply, the most stringent apply.
- I. Should any change in drawings or specifications be required to comply with governing regulations, notify and receive written approval from the Architect prior to submitting bid.
- J. All equipment and installations shall meet or exceed minimum requirements of ADA, ANSI, ASTM, IEEE, NEC, NEMA, NFPA, OSHA, UL, and the State Fire Marshall.
- K. Execute work in strict accordance with the best practices of the trades in a thorough, substantial, workmanlike manner by competent workmen. Provide a competent, experienced, full-time Project Manager who is authorized to make cost, scope, and schedule decisions on behalf of the Contractor.
- L. Provide a minimum of 4 hours of installation refresher training to all installers, delivered by the manufacturer, or manufacturer's representatives, within 2 weeks prior to the project start date.

1.8 WORK INCLUDED

- A. Provide labor and materials required to install, test and place into operation the Electronic Safety and Security System as called for in the Contract Documents, and in accordance with applicable codes and regulations. Labor, materials, or accessories not specifically called for in the Contract Documents, but required to provide complete, operating systems shall be provided without additional cost to the Owner.

- B. Electronic Safety and Security Systems include the following subsystems integrated into a single presentation to the operator:
 - 1. Video Surveillance
 - 2. Video Recording
- C. The work includes, but is not necessarily limited to, the following:
 - 1. Furnish all non-standard rough-in boxes for Division 26 installation.
 - 2. Conduit installation drawings for Division 26 rough-in.
 - 3. All devices, cabling, and terminations between the Electronic Safety and Security rooms, field devices, and control stations.
 - 4. All system programming and custom software development as required to meet the operational requirements.
 - 5. All physical cable management hardware, including but not limited to: "J-hooks" in accessible ceiling areas, conduits, ladder-type cable racks within and "D-rings" on backboards and equipment racks/cabinets/frames.
 - 6. Testing, labeling, and documentation of all cables and hardware installed under this contract.
 - 7. Preparation and submission of shop drawings, testing reports, as-built drawings, and cabling documentation.
 - 8. Fire stopping as required.
 - 9. CCTV system is provided and installed by owner.

1.9 COORDINATION

- A. Coordinate with other Divisions for Electronic Safety and Security work to be included but not listed in Division 16 or indicated on Electronic Safety and Security drawings.
- B. Visit the site and ascertain the conditions to be encountered in installing the Work under this Division, verify all dimensions and locations before purchasing equipment or commencing work, and make due provisions for same in the bid. Failure to comply with this requirement shall not be considered justification for omission, alteration, and incorrect or faulty installation of any of the Work under this Division or for additional compensation for any Work covered by this Division.
- C. Refer to Electronic Safety and Security drawings and drawings of the other trades and to relevant equipment drawings and shop drawings to determine the extent of clear spaces. Follow these drawings as closely as the actual construction and the work of other trades will permit. Provide all offsets, fittings, and accessories, required to clear equipment, beams and other structural members which may be required but not shown on the Drawings.
- D. Provide materials with trim that will fit properly the types of ceiling, wall, or floor finishes actually installed.
- E. Maintain a project manager, as specified by the Quality Assurance section of these specifications, on the jobsite at all times to coordinate this Work with other trades so that various components of the Electronic Safety and Security Systems are installed at the

proper time, fits the available space, allows proper service access to all equipment, and meets all required codes and standards.

- F. Carry on the Work in such a manner that the Work of the other trades will not be handicapped, hindered, or delayed at any time.
- G. Work of this Division shall progress according to the "Construction Schedule" as described in Division 1 and as approved by the Architect. Cooperate in establishing these schedules and perform the Work under this Division, in a timely manner in conformance with the construction schedule so as to ensure successful achievement of all schedule dates.
- H. The locations of cable termination fields, outlets, patch panels, equipment racks and other equipment indicated on the Drawings are approximately correct, but they are understood to be subject to such revision as may be found necessary or desirable at the time the work is installed in consequence of increase or reduction of the number of outlets, or in order to meet field conditions, or to coordinate with modular requirements of ceilings, or to simplify the work, or for other legitimate causes.
- I. Exercise particular caution with reference to the location of outlets, patch panels, control panels, switches, etc., and have precise and definite locations accepted by the Architect/Owner before proceeding with the installation.
- J. The Drawings show only approximate locations of outlets. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Architect for review before such alterations are made. Modifications shall be made at no additional cost to the Owner.
- K. Verify with the Architect the exact location and mounting height of outlets and equipment not dimensionally located on the Drawings.
- L. The drawings generally do not indicate the number of cables in conduit, or the actual identity of cables in specific conduits, cable tray or other cabling pathways. Provide the correct cable type and quantity as required by the indicated outlets, cable schedules, the design intent of any example drawings or schedules, referenced wiring diagrams (if any), the maximum distance limitations, and the applicable requirements of the NEC and ANSI/TIA/EIA-568.
- M. Carefully check space requirements with other trades to ensure that equipment can be installed in the spaces allotted.
- N. Wherever work interconnects with the work of other trades, coordinate with other trades to insure that they have the information necessary so that they may properly install the necessary connections and equipment. Identify items (Cable Trays, Fire stopping systems, pull boxes, etc.) requiring access in order that the Ceiling Trade will know where to install access doors and panels.
- O. Furnish and set sleeves for passage of Electronic Safety and Security System risers through structural masonry and concrete walls as required for the proper protection of each Electronic Safety and Security System riser passing through building surfaces.

- P. Provide fire stopping around all conduits, cable trays, sleeves, etc. which pass through rated walls and partitions.
- Q. Provide fire stopping around all cables within conduits, cable trays, sleeves, etc. as required in accordance with the specific fire stop system(s) being installed.
- R. Provide detailed information on openings and holes required in pre-cast members for Electronic Safety and Security System work.
- S. Provide required supports and hangers for equipment, designed so as not to exceed allowable loadings of structures.
- T. Examine and compare the Contract Drawings and Specifications with the Drawings and specifications of other trades, and report any discrepancies between them to the Architect and obtain written instructions for changes necessary in the work. Install and coordinate the work in cooperation with other related trades. Before installation, make proper provisions to avoid interferences.
- U. Wherever the work is of sufficient complexity, prepare additional detail drawings to scale to coordinate the work with the work of other trades. Detailed work shall be clearly identified on the Drawings as to the area to which it applies. Submit these drawings to the Architect for review. At completion include a set of these drawings with each set of Record Drawings.
- V. Furnish services of an experienced Project Manager as required by these specifications, who shall be in constant charge of all work, and who shall coordinate work with the work of other trades. No work shall be installed before coordinating with other trades.
- W. Coordinate with the local Service Provider Company or Companies as to their requirements for service connections and provide all necessary grounding, materials, equipment, labor, testing, and appurtenances.
- X. Before commencing work, examine adjoining work on which this work is in any way affected and report conditions, which prevent performance of the work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.
- Y. Adjust location of conduits, terminal blocks, equipment, etc., to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each conduit prior to fabrication.
 - 1. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. For example: condensate, steam, and plumbing drains normally have right-of-way. Lines whose elevations cannot be changed have right-of-way over lines whose elevations can be changed.
 - 2. Provide offsets, transitions, and changes in direction of conduit as required to maintain proper headroom and pitch on sloping lines.
- Z. In cases of doubt as to the work intended, or in the event of need for explanation, request supplementary instructions from the Architect.

1.10 MEASUREMENTS AND LAYOUTS

- A. The Drawings are schematic in nature, but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the Work. Figured dimensions take precedence to scaled dimensions. Determine exact locations by job measurements, by checking the requirements of other trades, and by reviewing all Contract Documents. Correct, at no additional costs to the Owner, errors that could have been avoided by proper checking and inspection.

1.11 SUBMITTALS

- A. Refer to Division 1 and General Conditions for submittal requirements.
- B. Supplemental to Division 1 requirements submit no fewer than 6 copies of the following documents to indicate the required personnel qualifications per the quality assurance section of this section:
 - 1. Member of staff required to be RCDD
 - a. A copy of the RCDD certificate, RCDD number, and BICSI member number must be provided with bidding documents.
 - 2. On-site project manager
 - a. A copy of the Certified Technician certificate and member number must be provided with bidding documents.
 - 3. Other personnel physically installing any portion of the Electronic Safety and Security System infrastructure.
 - a. A copy of the BICSI Commercial Installer certificate and BICSI member number must be provided with bidding documents.
 - b. If the contractor chooses to submit a similar certification from one of the conditionally approved vendor list the following must be included:
 - 1) A copy of each certification with the person's name and member number including the manufacturer's logo.
 - 2) A document provided by the manufacturer describing what specific subjects the certification covers, period of time spent doing course work required to gain certification, exam topics, and the requirements needed to maintain the certification.
 - 4. For all warranties required under this division and supplemental to Division 1 requirements submit no fewer than 6 copies of the following documents to indicate the required warranty terms and coverage's:
 - a. Warranty terms and conditions must contain the following:
 - 1) Length of warranty period
 - 2) Applications covered (future and present)

- 3) Single manufacturer responsible for fulfilling warranty.
 - 4) Who is covered.
 - 5) What is covered.
 - 6) All disclaimers, limitations, etc.
 - 7) What, if anything, is not covered
- C. Documentation supporting the proposed structured cabling warranty and all terms and conditions in accordance with the requirements set forth herein shall be submitted in writing. In addition to this warranty documentation, all certifications (individual and company) as required by guarantor of said warranty shall be submitted. These certifications shall only include those persons with direct association with this project and includes the expiration date and full name of each individual for which the certification is issued.
- D. Assemble and submit for review, manufacturers' product literature for material and equipment to be furnished, installed, or both, under this Division, including shop drawings, manufacturers' product data and performance sheets, samples, and other submittals required by this Division. Provide the number of submittals required by Division 1; however, at a minimum, submit six (6) sets.
- E. Provide submittals in sufficient detail so as to demonstrate compliance with these Contract Documents and the design concept.
- F. Refer to individual Sections of these Specifications for any additional submittal requirements.
- G. Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus to/from mailing time via the Architect, plus a duplication of this time for resubmittals, if required. Transmit submittals as soon as possible after Notice to Proceed and before construction starts.
- H. Before transmitting submittals and material lists, verify that the equipment submitted is mutually compatible with and suitable for the intended use. Verify that the equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- I. Submittals shall contain the following information. Submittals not so identified will be returned to the Contractor without action:
1. The project name.
 2. The applicable Specification Section and paragraph.
 3. The submittal date.
 4. The Contractor's stamp, which shall certify that the stamped drawings have been checked by the Contractor, comply with the Drawings and Specifications, and have been coordinated with other trades.
- J. The Engineer's checking and subsequent acceptance of such submittals shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless

he has, in writing, called the Engineer's and Architect's attention to such deviations at the time of submission, and secured written acceptance; nor shall it relieve him from responsibility for errors in dimensions, details, sizes of members, or quantities; or for omissions of components or fittings; or for not coordinating items with actual building conditions and adjacent work.

1.12 ELECTRONIC DRAWING FILES

- A. In preparation of shop drawings, Contractor may, at his option, obtain electronic drawing files in AutoCAD or DXF format from the Engineer. Contact the Architect for Architect's written authorization. Complete and send the form attached at the end of this section. Indicate the desired shipping method and drawing format on the attached form. In addition to payment, Architect's written authorization and Engineer's release agreement form must be received before electronic drawing files will be sent.

1.13 SUBSTITUTIONS

- A. Refer to Bid documents, General and Supplementary Conditions and Division 1 Specification Sections for limitations and restrictions on substitutions.
- B. Materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution.
- C. No substitutions will be considered with receipt of Bids, unless the Architect and Engineer have received from the Bidder a written request for approval to bid a substitution at least ten calendar days prior to the date for receipt of Bids, and have approved the substitution request. Include, with each such request, the name of the material or equipment for which substitution is being requested, and a complete description of the proposed substitution, including drawings, cut sheets, performance and test data, and all other information necessary for an evaluation. Include also a statement setting forth changes in other materials, equipment or other work that would be required to incorporate the substitution. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's or Engineer's decision to approve or disapprove a substitution in a Bid is final.
- D. Indicate revisions required to adapt substitutions including revisions by other trades. Substitutions that increase the cost of the work and related trades are not permitted.
- E. If the proposed substitution is approved prior to receipt of Bids, such approval will be stated in an Addendum. Bidders shall not rely upon approvals made in any other manner, including verbal. Acceptance of substitute equipment manufacturers does not relieve Contractor of the responsibility to provide equipment and materials, which meet the performance as stated or implied in the Contract Documents.
- F. No substitutions will be considered after receipt of Bids and before award of the Contract.
- G. No substitutions will be considered after the Contract is awarded unless specifically provided in the Contract Documents.

H. Proposals for substitutions shall include the following information:

1. A description of the difference between the Contract Document requirements and that of the substitution, the comparative features of each, and the effect of the change on the end result performance. Include the impact of all changes on other contractors and acknowledge the inclusion of additional costs to the other trades.
2. Schematic drawings and details.
3. List of revisions to the Contract Documents that must be made if the substitution is accepted.
4. Estimate of costs the Owner may incur in implementing the substitution, such as test, evaluation, operating and support costs.
5. Statement of the time by which a Contract modification accepting the substitution must be issued, noting any effect on the Contract completion time or the delivery schedule.
6. A statement indicating the reduction to the Contract price if the Owner accepts the substitution. Include required modifications to all related trades.

I. Alternate contractor/installer/personnel qualification requirements for submittals.

1.14 OPERATION AND MAINTENANCE DATA

- A. Refer to Division 1 and General Conditions for Operation and Maintenance Data.
- B. Submit data prior to requesting the final punch list and before all requests for Substantial Completion.
- C. Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division.
- D. Prior to Substantial Completion of the project, furnish to the Architect, for Engineer's review, and for the Owner's use, four (4) copies of brochures in three-ring, loose-leaf, hard-back notebook form, divided and tabbed, containing equipment data, approved submittals, shop drawings, diagrams, capacities, spare part numbers, manufacturer's service and maintenance data, warranties, guarantees, etc. Include local contacts complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications.

1.15 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish spare parts and extra materials as recommended for normal service requirements.

1.16 RECORD DRAWINGS

- A. Keep a set of jobsite work prints of the Issued for Construction Drawings on the jobsite during construction, for the purpose of annotating changes. During the course of

construction, indicate on these Documents, changes made from the Conformed Contract Documents. Pay particular attention to those items that require locating for servicing.

- B. Refer to Division 1 and General Conditions for Record Drawings
- C. At the completion of the project, obtain reproducible bond copies of the final Drawings and incorporate changes noted on the jobsite work prints onto these drawings. These changes shall be done by a skilled drafter. Mark each sheet "Record Drawing", along with the date, and deliver these Record Drawings to the Architect.

1.17 DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 and General Conditions for Delivery, Storage and Handling.
- B. Deliver equipment and material to the job site in their original containers with labels intact, fully identified with manufacturer's name, make, model, model number, type, size, capacity and Underwriters' Laboratories, Inc. labels and other pertinent information necessary to identify the item.
- C. Deliver, receive, handle and store equipment and materials at the job site in the designated area and in such a manner as to prevent equipment and materials from damage and loss. Store equipment and materials delivered to the site on pallets and cover with waterproof, tear resistant tarp or plastic or as required to keep equipment and materials dry. Follow manufacturer's recommendations, and at all times, take every precaution to properly protect equipment and material from damage, including the erection of temporary shelters to adequately protect equipment and material stored at the Site. Equipment and/or material which becomes rusted or damaged shall be replaced or restored by the Contractor to a condition acceptable to the Architect and Engineer.
- D. Be responsible for the safe storage of tools, material, and equipment.

1.18 WARRANTIES

- A. Refer to Division 1 and General Conditions for Warranties.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- C. Warrant each system and each element thereof against all defects due to faulty workmanship, design or material for a period of 12 months from date of Substantial Completion, unless specific items are required to carry a longer warranty in these Construction Documents or manufacturer's standard warranty exceeds 12 months. Remedy all defects, occurring within the warranty period(s), as stated in the General Conditions and Division 1.
- D. All components, including but not limited to, connectors, terminal blocks, cabling, and all other components considered to be a part of what is commonly referred to as an end-to-end solution for all UTP, and Coaxial backbone and horizontal cabling systems, shall be warranted for a minimum period of 1 year from the date of installation against defects in materials, equipment and workmanship. This warranty shall also include the

performance of these systems. This warranty shall include transmission requirements as specified in applicable ANSI/TIA/EIA/IEC/ISO standards for each cable system specified. This warranty shall also include all current and future applications designed for and becomes available under warranty for each cable system.

- E. Warranty of cabling and connectivity must be guaranteed by a single reputable manufacturer.
- F. The warranty shall include labor and material. Make repairs or replacements without any additional costs to the Owner.
- G. Perform the remedial work promptly, upon written notice from the Architect or Owner.
- H. At the time of Substantial Completion, deliver to the Owner all warranties, in writing and properly executed, including term limits for warranties extending beyond the one-year period, each warranty instrument being addressed to the Owner and stating the commencement date and term.

1.19 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits specified by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. Use only products listed for their intended use by a NRTL, except products for which no relevant standards exist.
- B. Where products are required to be NRTL listed, classified, approved or otherwise each individual item shall bear the NRTL mark by permanent means.
- C. Provide products and materials that are new, clean, free of defects, and free of damage and corrosion.
- D. Products and materials shall not contain asbestos, PCB, or any other material, which is considered hazardous by the Department of Environmental Protection or any other authority having jurisdiction.
- E. Replace materials of less than specified quality and relocate work incorrectly installed as directed by the Architect.
- F. Provide name/data plates on major components of equipment with manufacturer's name, model number, serial number, capacity data and electrical characteristics attached in a conspicuous place.

- G. Install materials and equipment with qualified trade people.
- H. Maintain uniformity of manufacturer for equipment used in similar applications and sizes.
- I. Follow manufacturer's instructions for installing, connecting, and adjusting equipment. Provide a copy of such instructions at the equipment during installation.
- J. Where factory testing of equipment is required to ascertain performance and attendance by the Owner's representative is required to witness such tests, associated travel costs and subsistence shall be paid for by the Contractor.
- K. Equipment capacities, ratings, etc., are scheduled or specified for job site operating conditions. Equipment sensitive to altitude shall be de-rated with the method of de-rating identified on the submittals.
- L. Enclosures for Electronic Safety and Security System Infrastructure equipment installed in mechanical equipment rooms shall be NEMA type 1 gasketed. Enclosures for Electronic Safety and Security System Infrastructure equipment installed outdoors shall be NEMA type 3R.
- M. If products and materials are specified or indicated on the drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of product data submittal.
- N. Ship and store all products and materials in a manner that will protect them from damage, weather and entry of debris. If items are damaged, do not install, but take immediate steps to obtain a replacement. Repairs of damaged goods will only be permitted with prior written permission of the Owner/Engineer.
- O. Part numbers and product codes in these specifications are correct as of the time of writing. Manufacturers may, however, change part numbers and product codes on short notice. In cases where part numbers or product codes differ from technical specifications for a particular product, provide products meeting the minimum technical specifications of the products in the specifications. Notify the Owner/Engineer of any product code and or part number changes on the material list submittal.
- P. Product Consistency: Any given item of equipment or material shall be the product of one manufacturer throughout the facility. Multiple manufacturers of any one item will not be permitted, unless specifically noted otherwise. In particular, the glass used in the construction of the fiber optic cables, the same manufacturer shall make pigtails and patch cords.

PART 3 - EXECUTION

3.1 FEES AND PERMITS

- A. Secure and Pay all required fees and obtain all required permits related to the Electronic Safety and Security System Infrastructure installation. Arrange with the various service

provider companies for the installation and connection of all required services to this facility and pay all charges associated therewith including connection charges and inspection fees, except where these services or fees are designated to be provided by others.

- B. Pay royalties or fees in connection with the use of patented devices and systems.

3.2 SUBMITTALS AND REVIEWS

- A. Submit shop drawings, manufacturer's product data sheets, samples, and test reports as specified.
 - 1. Shop Drawings: See sub-paragraph N, below.
 - 2. Samples as requested shall be physical examples that represent materials, equipment or workmanship and establish standards by which the work will be judged. Samples will not be returned to the Contractor.
 - 3. Test Reports:
 - a. Pre-Installation Testing Reports: Submit two sets of manufacturers' or field-testing reports for those materials identified in the individual system Specification Sections as requiring that such reports be submitted.
 - b. Post-Installation Testing Reports: See Specification Sections in Division 26.
- B. Within two weeks after notice to proceed by the Owner or Owner's Representative, or after execution of Owner/Contractor Agreement, submit a complete typed list of all Electronic Safety and Security System Infrastructure equipment manufacturers and material suppliers for the equipment proposed to be provided on this project, as well as names of all subcontractors.
- C. After the Contract is awarded, obtain complete shop drawings, product data and samples from the manufacturers, suppliers, vendors, and all subcontractors, for all materials and equipment as specified. Submit data and details of such materials and equipment for review. Prior to submission, certify that the shop drawings, product data and samples are in compliance with the Contract Documents. Check all materials and equipment upon their arrival on the job site and verify their compliance with the Contract Documents. Modify any work, which proceeds prior to receiving accepted shop drawings as required to comply with the Contract Documents and the shop drawings.
- D. Review of submittals is for general compliance with the design concept and Contract Documents. Comments or absence of comments shall not relieve the Contractor from compliance with the Contract Documents. The Contractor remains solely responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of construction, for performing the work in a safe manner, and for coordinating the work with that of other trades.
- E. No part of the work shall be started in the shop or in the field until the shop drawings and samples for that portion of the work have been submitted and accepted.
- F. A minimum period of ten working days, exclusive of transmittal time, will be required in the Engineer's office each time a shop drawing, product data and/or samples are

submitted for review. This time period must be considered by the Contractor in the scheduling of the work.

- G. Submit 3 bond prints of all items requiring shop drawings. Submit 6 copies of manufacturer's product submittals.
- H. Submit materials and equipment by manufacturer, trade name, and model number. Include copies of applicable brochure or catalog material. Maintenance and operating manuals are not acceptable substitutes for shop drawings.
- I. Identify each sheet of printed submittal pages (using arrows, underlining, or circling) to show applicable sizes, types, model numbers, ratings, capacities and options actually being proposed. Cross out non-applicable information. Note specified features such as materials or paint finish.
- J. Include dimensional data for roughing in and installation and technical data sufficient to verify that equipment meets the requirements of the Contract Documents. Include wiring, piping and service connection data.
- K. Maintain a complete set of reviewed and stamped shop drawings and product data on site.
- L. The work described in shop drawing submissions shall be carefully checked by all trades for clearances (including those required for maintenance and servicing), field conditions, maintenance of architectural conditions and coordination with other trades on the job. Each submitted shop drawing shall include a certification that related job conditions have been checked by the Contractor and each Subcontractor and that conflicts do not exist.
- M. The Contractor is not relieved of the responsibility for dimensions or errors that may be contained on submissions, or for deviations from the requirements of the Contract Documents. The noting of some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the shop drawings, product data and samples, the Contract Documents govern the work and are neither waived nor superseded in any way by the review of shop drawings, product data and samples.
- N. Inadequate or incomplete shop drawings, product data and/or samples will not be reviewed and will be returned to the Contractor for resubmittal.

- O. Indicate the following on the lower right-hand corner of each shop drawing and on the front cover of each product data brochure cover: The submittal identification number; title of the sheet or brochure; name and location of the project; names of the Architect, Engineer, Contractor, Subcontractor, manufacturer, supplier, and vendor; the date of submittal; and the date of each correction, version and revision. Number all pages and drawings in product data brochures consecutively from beginning to end. Unless the above information is included, the submittal will be returned for re-submission. Resubmittals of product data or brochures shall include a cover letter summarizing the corrections made in response to the review comments.

3.3 EXAMINATION OF SITE

- A. Prior to the submitting of bids, visit the project site and become familiar with all conditions affecting the proposed installation and make provisions as to the cost thereof.
- B. The Contract Documents do not make representations regarding the character or extent of the subsoils, water levels, existing structural, mechanical, electrical and Electronic Safety and Security System installations, above or below ground, or other sub-surface conditions which may be encountered during the work. Evaluate existing conditions, which may affect methods or cost of performing the work, based on examination of the site or other information. Failure to examine the Drawings or other information does not relieve the Contractor of responsibility for satisfactory completion of the work.

3.4 ACCESS TO EQUIPMENT

- A. Locate all pull boxes, junction boxes and fire stopping systems so as to provide easy access for operation, service inspection and maintenance. Provide an access door where equipment or devices are located above inaccessible ceilings.
- B. Maintain all code required clearances and clearances required by manufacturers.

3.5 CUTTING AND PATCHING

- A. Where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of conduit or other equipment, layout the work carefully in advance. Repair any damage to the building, piping, equipment or defaced finished plaster, woodwork, metalwork, etc. using skilled tradespeople of the trades required at no additional cost to the Owner.
- B. Do not cut, channel, chase or drill masonry, tile, etc., unless permission from the Architect is obtained. If permission is granted, perform this work in a manner acceptable to the Architect.
- C. Patch around all openings to match adjacent construction.
- D. Where conduit or equipment is mounted on a painted finished surface, paint to match the surface. Cold galvanize bare metal whenever support channels are cut.

- E. Provide slots, chases, openings, and recesses through floors, walls, ceilings, and roofs as required. Where these openings are not provided, provide cutting and patching to accommodate penetrations at no additional cost to the Owner.
- F. After the final waterproofing membrane has been installed, roofs may be cut only with written permission by the Architect.

3.6 MOUNTING HEIGHTS

- A. Mounting heights shall conform to ADA requirements.
- B. Mounting heights shall be from floor to center of device, unless otherwise noted. Verify exact locations and mounting heights with the Architect before installation.
- C. Wall mounted devices requiring operational access shall be mounted a minimum of 15 inches above finished floor to bottom of device and a maximum of 48 inches above finished floor to top of device.

3.7 PAINTING

- A. Refer to Division 9 Section "Painting" for painting requirements.
- B. Paint exposed ferrous surfaces, including, but not limited to, hangers, equipment stands and supports using materials and methods as specified under Division 9 of the Specifications; colors shall be as selected by the Architect.
- C. Re-finish all field-threaded ends of galvanized conduits and field-cut ends of galvanized supports with a cold-galvanizing compound approved for use on conductive surfaces. Follow closely manufacturer's instructions for pre-cleaning surfaces and application.
- D. Where factory finishes are provided and no additional field painting is specified, touch-up or refinish, as required by, and to the acceptance of, the Architect and Engineer, marred or damaged surfaces so as to leave a smooth, uniform finish. If, in the opinion of the Architect or Engineer, the finish is too badly damaged to be properly re-finished, replace the damaged equipment or materials at no additional costs to the Owner.
- E. Provide touch-up paint as required by Specification Sections in this Division.

3.8 CLEANING

- A. Avoid accumulation of debris, boxes, loose materials, crates, etc., resulting from the installation of this work. Remove from the premises each day all debris, boxes, etc., and keep the premises clean and free of dust and debris.
- B. Immediately prior to final inspection, make a final cleanup of dirt and refuse resulting from Work and assist in making the premises vacuum clean. Clean all material and equipment installed under this Division.
- C. Clean all fixtures and equipment at the completion of the project. Wipe clean exposed lighting fixture reflectors and trim pieces with a non-abrasive cloth just prior to occupancy.

- D. Remove dirt, dust, plaster, stains, and foreign matter from all surfaces.
- E. Touch up and restore damaged finishes to their original condition.
- F. All Electronic Safety and Security System Infrastructure equipment shall be thoroughly vacuumed and wiped clean prior to energization and at the completion of the project. Equipment shall be opened for observation by the Architect as required.

3.9 WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, make penetration prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. Restore waterproofing integrity of walls or surfaces after they have been penetrated without additional cost to the Owner.

3.10 SUPPORTS

- A. Support work in accordance with the best industry practice. Provide supports, hangers, auxiliary structural members, and supplemental hardware required for support of the work.
- B. Provide supporting frames or racks extending from floor slab to ceiling slab for work indicated as being supported from walls where the walls are incapable of supporting the weight. In particular, provide such frames or racks in Electronic Safety and Security System rooms and equipment rooms.
- C. Provide supporting frames or racks for equipment, which is installed in a freestanding position.
- D. Supporting frames or racks shall be of standard angle, standard channel, or specialty support system steel members, rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.
- E. Adequate support of equipment (including outlet, pull and junction boxes and fittings) shall not depend on electric conduits, raceways, or cables for support.
- F. Electronic Safety and Security System equipment shall not rest on or depend for support on suspended ceiling media (tiles, lath, plaster, as well as splines, runners, bars and the like in the plane of the ceiling). Provide independent support of Electronic Safety and Security System equipment. Do not attach to supports provided for ductwork, piping, or work of other trades.
- G. Provide required supports and hangers for conduit, equipment, etc., so that loading will not exceed allowable loadings of structure. Electronic Safety and Security System equipment and supports shall not come in contact with work of other trades.

3.11 FASTENINGS

- A. Fasten equipment to building structure in accordance with the best industry practice.
- B. Where weight applied to the attachment points is 100 pounds or less, conform to the following as a minimum:
 - 1. Wood: Wood screws.
 - 2. Concrete and solid masonry: Bolts with expansion shields.
 - 3. Hollow construction: Toggle bolts.
 - 4. Solid metal: Machine screws in tapped holes or with welded studs.
 - 5. Steel decking or sub-floor: Fastenings as specified below for applied weights in excess of 100 pounds.
- C. Where weight applied to building attachment points exceeds 100 pounds, but is 300 pounds or less, conform to the following as a minimum:
 - 1. At concrete slabs provide 24-inch x 24 inch x 1/2-inch steel fishplates on top with through bolts. Fishplate assemblies shall be chased in and grouted flush with the top of slab screed line, where no fill is to be applied.
 - 2. At steel decking or sub-floor for all fastenings, provide through bolts or threaded rods. The tops of bolts or rods shall be set at least one inch below the top fill screed line and grouted in. Suitable washers shall be used under bolt heads or nuts. In cases where the decking or subfloor manufacturer produces specialty hangers to work with his decking or sub-floor such hangers shall be provided.
- D. Where weight applied to building attachment points exceeds 300 pounds, coordinate with and obtain the approval of Architect and conform to the following as a minimum:
 - 1. Provide suitable auxiliary channel or angle iron bridging between building structural steel elements to establish fastening points. Bridging members shall be suitably welded or clamped to building steel. Provide threaded rods or bolts to attach to bridging members.
- E. For items, which are shown as being ceiling mounted at locations where fastening to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging tying to the building structural elements.
- F. Wall mounted equipment may be directly secured to wall by means of steel bolts. Groups or arrays of equipment may be mounted on adequately sized steel angles, channels, or bars. Prefabricated steel channels as manufactured by Kindorf or Unistrut are acceptable.

3.12 IDENTIFICATION

- A. Wherever raceways for future use are terminated outside of the building, stake the location with a 2-foot long, 1-inch x 1-inch clear heart redwood stake.
- B. See individual sections for any additional identification requirements.

- C. In all public areas, tenant areas, and similar locations within the project, the inclusion or installation of any equipment or assembly which bears on any exposed surface any name, trademark, or other insignia which is intended to identify the manufacturer, the vendor, or other source(s) from which such object has been obtained, is prohibited.
- D. Required UL labels shall not be removed, nor shall identification specifically required under the various technical sections of the Specifications be removed.

3.13 DELIVERY, DRAYAGE AND HAULING

- A. Provide drayage, hauling, hoisting, shoring and placement in the building of equipment specified and be responsible for the timely delivery and installation of equipment as required by the construction schedule. If any item of equipment is received prior to the time that it is required, and provide proper storage and protection until the time it is required. Pay for all costs of demurrage or storage.
- B. If equipment is not delivered or installed at the project site in a timely manner as required by the project construction schedule, then Contractor shall be responsible for resulting disassembly, reassembly, manufacturer's supervision, shoring, general construction modification, delays, overtime costs, etc. at no additional cost to the Owner.

3.14 EQUIPMENT AND MATERIAL PROTECTION

- A. Protect the work, equipment, and material of other trades from damage by work or workmen of this trade, and correct damaged caused without additional cost to the Owner.
- B. Take responsibility for work, materials, and equipment until finally inspected, tested, and accepted. Protect work against theft, injury, or damage, and carefully store material and equipment received on site, which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material. Cover and protect equipment and materials from damage due to water, spray-on fireproofing, construction debris, etc. Store equipment in dry, conditioned spaces.
- C. Provide adequate means for fully protecting finished parts of materials and equipment against damage from whatever cause during the progress of the work until final acceptance. Protect materials and equipment in storage and during construction in such a manner that no finished surfaces will be damaged or marred, and moving parts are kept clean and dry. Do not install damaged items; take immediate steps to obtain replacement or repair.

3.15 ADJUSTING, ALIGNING AND TESTING

- A. Adjust, align and test all Electronic Safety and Security System equipment furnished and/or installed under this Division.
- B. Check and test protective devices for specified and required application, and adjust as required.
- C. Verify that completed wiring system is free from short circuits, unintentional grounds, low insulation impedances, and unintentional open circuits.

- D. Notify the Architect immediately of all operational failures caused by defective material, labor, or both.
- E. Refer to individual Sections for additional and specific requirements.

3.16 START-UP OF SYSTEMS

- A. Prior to start-up of Electronic Safety and Security System systems, check all components and devices, to confirm compliance with manufacturers' recommended installation procedures.
- B. Demonstrate that all equipment and systems perform properly as designed per Drawings and Specifications.

3.17 TEST REPORTS FOR ELECTRONIC SAFETY AND SECURITY SYSTEM INFRASTRUCTURE SYSTEMS

- A. Perform tests as required by these Specifications and submit the results. The tests shall establish the adequacy, quality, safety, and reliability for each Electronic Safety and Security sub-system system as well as the overall installed system. See individual sections, particularly in Division 28, for extent of testing required. Notify the Architect and Engineer two working days prior to each test.
- B. Comply with the project construction schedule for the date of final performance and acceptance testing, and complete work sufficiently in advance of the Contract completion date to permit the execution of the testing prior to occupancy and Contract closeout. Complete any adjustments and/or alterations, which the final acceptance tests indicate as necessary for the proper functioning of all equipment prior to the completion date.
- C. For specific testing requirements of sub-systems, refer to the Specification section that describes that system.
- D. Provide a detailed schedule of completion indicating when each system is to be completed and outlining when field-testing will be performed. Submit completion schedule for review within six months after the notice to proceed by Owner's Representative has been given. Update this schedule periodically as the project progresses.
- E. Upon completing each test, record the results, date and time of each test and the conditions under which the test was conducted. Submit to the Architect, for Engineer's review, in duplicate. Supply all test results required by Division 28 specifications.
- F. Promptly correct all failures or deficiencies revealed by these tests and as determined by the Engineer.

3.18 OPERATING INSTRUCTIONS

- A. Provide the services of factory trained specialists to provide operating and maintenance training for equipment and systems. Separate seminars shall be provided for operating staff and for maintenance staff. Maintenance staff shall attend both seminars. Conduct

training over a four-day (consecutive) period to include one session per shift of each type of training, minimum of two shifts. Instruction time is defined as on-site time during customer's working hours and does not include nights, weekends, or travel time to and from the project.

- B. Submit training agenda, schedule, and list of representatives to the Owner for approval thirty days prior to suggested date of training. Do not commence training until the Owner has issued a written acceptance of the starting times and attendees. Confirm attendance of seminar by written notification to participants.
- C. Instruct Owner's operating personnel in proper starting sequences, operation, and shutdown. Instruct maintenance personnel in general and preventative maintenance procedures, trouble shooting, and normal and emergency procedures.
- D. Each training session shall be video recorded in its entirety. Contractor shall combine the best takes of the same type training into a single session video. Enhance video with editing and insertion of necessary slides and audio to develop comprehensive training videos. Provide logical "chapters" to facilitate jumping to specific subject matter areas without having to view the entire video. Furnish two (2) copies of each DVD training video to owner with two (2) spare training manuals of each type.
- E. Submit a written record of minutes and attendees of the training sessions to the Owner.
- F. Submit final copies of Record Drawings and Operating and Maintenance Manuals to Owner at seminar.

3.19 OPERATING AND MAINTENANCE MANUALS

- A. Provide Operating and Maintenance Manuals for equipment and materials furnished under this Division.
- B. Submit three final copies of Operating and Maintenance Manuals for review at least eight weeks before the projected completion date. Assemble data in a completely indexed volume or volumes in three-ring binders and identify the size, model, and features indicated for each item. Print the project name on the outside of the binders.
- C. Maintenance manuals shall include complete cleaning and servicing data compiled in a clear and easily understandable format. Show model numbers of each piece of equipment, complete lists of replacement parts, capacity ratings, and actual loads.
- D. Provide the following information where applicable:
 - 1. Identifying name and mark number.
 - 2. Locations (where several similar items are used, provide a list).
 - 3. Certified Record Drawings and Final Reviewed submittals.
 - 4. Parts list.
 - 5. Wiring diagrams.
 - 6. Manufacturer's recommended operating and maintenance instructions with all non-applicable information deleted.
 - 7. List of spare parts inventory recommended for normal service requirements.

8. Test reports.
9. Trouble shooting diagnostic instructions where applicable.

3.20 SUBSTANTIAL COMPLETION REVIEW

- A. Prior to requesting a site observation for "CERTIFICATION OF SUBSTANTIAL COMPLETION", complete the following items:
 1. Submit complete Operation and Maintenance Data.
 2. Submit complete Record Drawings.
 3. Perform all required training of Owner's personnel.
 4. Turn over all spares and extra materials to the Owner, along with a complete inventory list of spares and extra materials being turned over.
 5. Perform start-up tests of all systems.
 6. Remove all temporary facilities from the site.
 7. Comply with all requirements for Substantial Completion in the Division 1 and General Conditions.
- B. Request in writing a review for Substantial Completion. Give the Architect at least seven (7) days' notice prior to the review.
- C. State in the written request that the Contractor has complied with the requirements for Substantial Completion.
- D. Upon receipt of a request for review, the Architect will either proceed with the review or advise the Contractor of unfilled requirements.
- E. If the Contractor requests a site visit for Substantial Completion review prior to completing the above-mentioned items, then provide reimbursement to the Architect and Engineer for time and expenses incurred for the visit.
- F. Upon completion of the review, the Architect and Engineer will prepare a "final list" of outstanding items to be completed or corrected for final acceptance.
- G. Omissions on the "final list" shall not relieve the Contractor from the requirements of the Contract Documents.
- H. Prior to requesting a final review, submit a copy of the final list of items to be completed or corrected. State in writing that each item has been completed, resolved for acceptance or the reason it has not been completed.

3.21 RECORD DRAWINGS

- A. Maintain on a daily basis at the project site a complete set of Record Drawings, reflecting an accurate dimensional record of deviations between work shown on Drawings and that actually installed.
- B. Record dimensions clearly and accurately to delineate the work as installed; suitably identify locations of all equipment by at least two dimensions to permanent structures. In addition, mark the Record Drawings to show the precise location of concealed work and

equipment, including concealed or embedded raceways and cables and all changes and deviations in the Electronic Safety and Security System Infrastructure work form that shown on the Contract Documents. This requirement shall not be constructed as authorization to make changes in the layout or work.

- C. Upon completion of the installation obtain from the Architect, a complete set of bond drawings with professional's seal and firm name removed. In a neat and accurate manner, provide a complete record of all revisions of the original drawings, as actually installed. The cost for transparencies and for making required changes shall be included in the Contract. Submit one set of black line prints of these revised transparencies for review. After review, make necessary changes to transparencies and then deliver them to the Owner. The Record Drawings shall not be reviewed for accuracy nor will the Engineer assume any responsibility for accuracy of completeness.
- D. Submit the as-built Electronic Safety and Security System cabling schedules in three (3) final printed copies and on a CD or DVD as comma delimited ASCII format files (or other mutually acceptable media and format).

3.22 FINAL PUNCHLIST

- A. Prior to the Final Punchlist, certify that systems and equipment are complete, operational, and are in compliance with the Contract Documents.
- B. During the Final Punchlist, provide personnel with access keys, handheld radios, and necessary expertise to operate each system and piece of equipment to demonstrate operational compliance with the Contract Documents.
- C. Any deficiencies noted on the Final Punchlist shall be expeditiously corrected and certified in writing.

3.23 ACCEPTANCE

- A. Perform all tests required by local authorities, in addition to tests specified herein.
- B. Provide a minimum of 2 technicians on-site for each major systems cutover. Technicians shall be ready with all necessary tools, test equipment, and supplies necessary to troubleshoot and correct cabling system faults.
- C. Upon receipt of the Contractor's documentation of cable testing, the Owner will review/observe the installation and randomly request tests of the cables/wires installed. Once all cables required by these construction documents have been tested and pass in accordance with sections in Division 28 and the Owner is satisfied that all work is in accordance with the Contract Documents, the Owner will notify the Contractor in writing that the work has been accepted.

3.24 SPECIAL TOOLS

- A. Delivery to Owner's representative 2 complete sets of all special tools and small equipment items needed for proper operation, adjustment and maintenance of cabling

and equipment installed under this work. All tools to be new and still in manufacturers packaging. The cost for these tools is to be included within the bid price for this work.

- B. The terms “special tools” and “small equipment items” is meant to include such items as punch down tools, connector assembly tools, etc. with each individual item having a retail replacement cost not exceeding five hundred dollars (\$500.00). It is NOT meant to include common hand tools such as standard screwdrivers, pliers, wrenches, etc.
- C. Submit the tool list along with the bid for this work. Include add/delete unit pricing for all tools on the list.

END OF SECTION 280500

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings 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. UTP cabling.
 - 2. Coaxial cabling.
 - 3. RS-232 cabling.
 - 4. RS-485 cabling.
 - 5. Low-voltage control cabling.
 - 6. Control-circuit conductors.
 - 7. Identification products.
 - 8. Pathway support materials.

1.3 DEFINITIONS

- A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
- B. BICSI: Building Industry Consulting Service International.
- C. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid bottom channel section.
- D. EMI: Electromagnetic interference.
- E. IDC: Insulation displacement connector.
- F. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- G. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- H. Open Cabling: Passing cabling through open space (e.g., between the studs of a wall cavity).
- I. RCDD: Registered Communications Distribution Designer.

- J. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal side rails, and a bottom without ventilation openings.
- K. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.
- L. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For all cable, include the following installation data for each type used.
 - a. Manufacturer.
 - b. Manufacturer's part number.
 - c. Complete cable composition description.
 - d. Electrical characteristics.
 - e. Nominal OD.
 - f. Minimum bending radius.
 - g. Maximum pulling tension.
 - h. Wet or dry listing.
 - 2. For cable management and pathways, include data providing:
 - a. Manufacturer.
 - b. Complete product description.
 - c. Identify all fittings and components.
- B. Source quality-control reports.
- C. Field quality-control reports.
- D. Maintenance Data: For wire and cable to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Electrical Wiring Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of UTP cable for open and short circuits after installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install UTP, optical fiber, or coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. Support of Open Cabling: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-rings.
 - 3. Straps and other devices.
- B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
 - 1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements for plywood backing panels in Division 06 Section "Rough Carpentry".

2.3 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden CDT Inc.; Electronics Division.
 - 2. CommScope; Systimax Solutions or Uniprise Solutions
 - 3. Draka USA.
 - 4. Genesis Cable Products; Honeywell International, Inc.
 - 5. KRONE Incorporated.
 - 6. Mohawk; a division of Belden CDT.
 - 7. Superior Essex Inc.
 - 8. Berk-Tek; a Nexans Company
- B. Description: 100-ohm, 4-pair UTP covered with a gray jacket.
 - 1. Comply with ICEA S-90-661 for mechanical properties.
 - 2. Comply with TIA/EIA-568-B.1 for performance specifications.
 - 3. Comply with TIA/EIA-568-B.2, Category 6.

4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, General Purpose: Type CM or CMG.
 - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
 - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
 - d. Communications, Limited Purpose: Type CMX.
 - e. Multipurpose: Type MP or MPG.
 - f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
 - g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.4 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Belden CDT Inc.; Electronics Division.
 2. CommScope; Systimax Solutions or Uniprise Solutions
 3. Hubbell Premise Wiring.
 4. KRONE Incorporated.
 5. Leviton Voice & Data Division.
 6. Nordex/CDT; a subsidiary of Cable Design Technologies.
 7. Panduit Corp.
 8. Simon Co. (The).
 9. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.
- C. Connecting Blocks: 110-style for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

2.5 COAXIAL CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Alpha Wire Company.
 2. Belden CDT Networking Division/NORDX.
 3. Coleman Cable, Inc
 4. CommScope, Inc.
 5. KRONE Incorporated.
 6. Draka Cableteq USA.
- B. General Coaxial Cable Requirements: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-11/U: NFPA 70, Type CATV.

1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

D. RG59/U: NFPA 70, Type CATVR

1. No. 20 AWG, solid, silver-plated, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.

E. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

F. RG59/U: NFPA 70, Type CATV.

1. No. 20 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum polyester tape and 40 percent aluminum braid.
3. PVC jacket.

G. RG59/U (Plenum Rated): NFPA 70, Type CMP.

1. No. 20 AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation.
2. Double shielded with 100 percent aluminum-foil shield and 65 percent aluminum braid.
3. Copolymer jacket.

H. NFPA and UL Compliance: Coaxial cables shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655, and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Cable: Type CATV.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR, complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

2.6 COAXIAL CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Emerson Network Power Connectivity Solutions; AIM Electronics brand.
 - 2. Leviton Voice & Data Division.
 - 3. Siemon
- B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.7 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway complying with UL 83.
- B. Class 2 Control Circuits: Stranded copper, power-limited cable in conduit up to bottom of structure and then concealed in building finishes complying with UL 83.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.8 IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Brady Corporation
 - 2. HellermannTyton.
 - 3. Kroy LLC.
 - 4. Panduit Corp.
- B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.9 SOURCE QUALITY CONTROL

- A. Factory test UTP cables according to TIA/EIA-568-B.2.
- B. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.
- C. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- B. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.
- D. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- E. Pathway Installation in Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Secure conduits to backboard when entering room from overhead.
 - 3. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- F. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
 - 7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 8. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.

9. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
1. Comply with TIA/EIA-568-B.2.
 2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- D. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1525 mm) apart.
 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- E. Outdoor Coaxial Cable Installation:
1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
 2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches (915mm).
- F. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.3 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.4 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with TIA/EIA-569-A, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

- A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment, and patch cords, and labeling of all components.
 3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 4. Coaxial Cable Tests: Comply with requirements in Division 27 Section "Master Antenna Television System."
- C. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide or transfer the data from the instrument to the computer, save as text files, print, and submit.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 280513

SECTION 281111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, and material as specified herein.
- B. This section requires the Contractor to furnish all materials required to install the fire alarm system. The Contractor shall be responsible for installing, testing, and start-up of a complete functioning fire alarm system, and each element thereof, as specified or indicated on the Drawings or reasonably inferred, including every article, device, or accessory (whether or not specifically called for by item) reasonably necessary to facilitate each system's function as indicated by the design and the equipment specified. Elements of the work include materials, labor, supervision, supplies, equipment, transportation, and utilities. Installation of devices shall be performed or supervised by a National Institute for Certification of Engineering Technologies (NICET) Level 2 or higher Fire Alarm Technician. Submit copies of the certification for employees through shop drawing submittals.
- C. All fire alarm system components shall include addressable field devices, and multiplexed, programmable, operator interface panels.
- D. The scope of work in this section includes:
 - 1. Fire alarm control panels.
 - 2. Remote annunciator panels.
 - 3. Manual fire alarm pull stations.
 - 4. Automatic smoke detectors.
 - 5. Fire alarm notification appliances.
 - 6. Auxiliary fire alarm equipment.
 - 7. Sprinkler system waterflow and valve tamper alarms.
 - 8. Air handling unit shutdown.
 - 9. Battery stand-by power.

- E. Where coordination and interfacing with other systems or equipment is required, it shall be the responsibility of the fire alarm system installer (contractor) to either provide the relays, contacts, power supplies and other necessary hardware or see to it that such hardware is provided with the other systems or equipment.

1.2 RELATED WORK IN OTHER SECTIONS

- A. The contractor shall coordinate work in this section with all related trades. Work and/or equipment provided in other sections and related to the fire alarm system shall include, but not be limited to:
 - 1. Sprinkler waterflow and valve tamper switches shall be provided by the fire sprinkler installer, but wired and connected by the fire alarm installer.
 - 2. Duct smoke detectors shall be furnished, wired and connected by the fire alarm system installer. The HVAC installer shall furnish necessary duct opening to install the duct smoke detector's housing.
 - 3. Air handling fan control circuits and contacts to be furnished by the HVAC control equipment.
 - 4. Conduit shall be by Division 26 "Common Work Results for Electrical".

1.3 APPLICABLE CODES AND STANDARDS

- A. Provide an integrated fire alarm system, which meets the codes and standards cited below and applicable local building and fire codes. All fire alarm equipment shall be Underwriters Laboratory (UL) and Factory Mutual (FM) approved for the type and class of service performed.
 - 1. NFPA 70 – National Electrical Code, 2011 Edition
 - 2. NFPA 72 – National Fire Alarm Code, 2010 Edition
 - 3. UL 864 – Control Units for Fire Protective Signaling Systems
 - 4. ULOJZ – Control Unit Systems
 - 5. UL 268 – Smoke Detectors for Fire Protective Signaling Systems
 - 6. UL 268A – Smoke Detectors for Duct Applications
 - 7. UL 464 – Audible Signal Appliances
 - 8. UL 38 – Manual Signaling Boxes for Fire Alarm Systems

9. UL 346 – Waterflow Indicators for Fire Protective Signaling Systems
10. UL 1971 – Signaling Devices for the Hearing Impaired
11. UL 1481 – Power Supplies for Fire Protective Signaling Systems
12. UL 1635 – Digital Alarm Communicator System Units
13. NFPA 90A – Installation of Air Conditioning and Ventilating Systems, Latest Edition
14. IBC 2012 Edition
15. IFC 2012 Edition
16. NFPA 101 – Life Safety Code
17. ANSI A117.1 – Americans with Disabilities Act (ADA) 1998 Edition

1.4 SYSTEM DESCRIPTION

- A. The fire alarm system shall be a non-coded manual and automatic fire alarm system with connections to a remote supervising station. Control panel shall be micro-processor based, with fully addressable alarm devices.

1.5 SUBMITTALS

- A. Reference specification section 260010, GENERAL ELECTRICAL REQUIREMENTS for general shop drawing submittal requirements. Also comply with the submittal requirements stated in this specification section. Submittals not complying fully with the submittal requirements of section 260010 and this section will be rejected.
- B. Submit a Description of Operation that explains in detail the specific methods the submitted fire alarm system functions. Pre-printed, generic material will not be accepted and will be rejected.
- C. Shop Drawings:
 1. The fire alarm system equipment vendor shall provide shop drawings showing fire alarm floor plans and a full building riser diagram. Fire alarm floor plans and riser diagram shall show fire alarm control panel, annunciator, all fire alarm initiating devices and notification appliances. Show typical wiring diagrams of control panel/s, annunciator and each device and wiring connections required.

Show all interfaces to other systems, such as temperature control systems, and security systems.

2. Shop drawing scale shall match the Engineer's drawings where possible. Scale shall not be less than 3/16" = 1'-0".
 3. The fire alarm floor plans and riser diagram shall show wiring to all fire alarm devices/appliances, indicating wire sizes and quantities as well as conduit/raceway sizes and locations of end-of-line (EOL) resistors. The fire alarm floor plans and riser diagram shall clearly show the routing of all fire alarm system wiring, including all horizontal routing and vertical routing (in chases). Routing of all fire alarm wiring shall comply with the "Survivability" requirements of NFPA 72.
 4. The fire alarm floor plans shall also contain a Bill of Materials and a Sequence of Operations Matrix that explains how the submitted fire alarm system functions.
- D. Product Data: Provide product cutsheets showing material specifications, electrical characteristics and connection requirements.
- E. Submittals and shop drawings shall not contain HEI's firm name or logo, nor shall it contain the HEI's engineers' seal and signature. They shall not be copies of HEI's work product. If the contractor desires to use elements of such product, the license agreement for transfer of information at the end of this section must be used. NICET certification information referred to in Section 1.1.B this section.
- F. Test Reports: Indicate satisfactory completion of required tests and inspections.
- G. Indicate within the submittal all applicable UL listings and all applicable approvals or certifications.
- H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.

1.6 PROJECT RECORD DOCUMENTS

- A. The fire alarm equipment vendor shall submit As-Built fire alarm drawings per the General and Supplemental Conditions. The Contractor shall be responsible for providing as-built field changes recorded on a set of blueprints to the fire alarm equipment vendor for inclusion in the Record Drawings.

- B. The record drawings shall show actual locations of initiating devices, notification appliances, and end-of-line devices. Show the approximate location, size and type of all wiring and routing of wiring. Drawings should also include one-line riser diagrams showing all devices.
- C. The Contractor and fire alarm equipment vendor shall sign off on the Record Drawings as being an accurate representation of the completed installation.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of the General and Supplemental Conditions.
- B. Operation Data: Operating instructions.
- C. Maintenance Data: Maintenance and repair procedures.
- D. Include in the O&M manual a copy of the service representative's contact list with all applicable phone and pager numbers.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with a minimum of three years documented experience.
- B. Installer: Company specializing in installing the products specified in this section with a minimum of three years documented experience. Shall be bondable and licensed Contractor and employ full-time factory-trained and certified installers and technicians. Installers shall provide with the fire alarm submittal proof of factory training for each installer.
- C. Final checkout and verification: Shall be conducted by a technician certified by the National Institute for Certification in Engineering Technologies (NICET) registered as level 2 or higher in the fire protection technology certification program. Provide certification information with fire alarm submittal.
- D. The equipment manufacturer's service department shall be fully stocked in standard parts and components and engaged in the maintenance of fire alarm systems. On-the-premises service shall be available within 4 hours of notification, 7 days a week, 24 hours a day.

1.9 SERVICE AND GUARANTEE

- A. Furnish service and maintenance of fire alarm system including wiring and raceways for one year from date of substantial completion.
- B. All components, system software, parts and assemblies shall be guaranteed against defects in materials and workmanship for the one-year period stated above.
- C. Labor (including travel expenses) to trouble-shoot, repair, reprogram, or replace components shall be furnished by this contractor at no charge during the warranty period.
- D. All corrective software modifications made during warranty periods shall be updated on all user documentation and on user and manufacturer archived software disks.

1.10 SPARE PARTS AND EXTRA MATERIALS

- A. Furnish extra materials as specified in Section 017700.
- B. Furnish spare parts described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.
 - 1. Furnish 10% of the total or a minimum of one (1) manual pull station.
 - 2. Furnish 10% of the total or a minimum of one (1) of each type of automatic smoke detector.
 - 3. Furnish 5% of the total or a minimum of one (1) of each strobe type and candela rating.
 - 4. Furnish 5% of the total or a minimum of one (1) of each horn type. Combination horn /strobe units matching the units installed are acceptable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products manufactured by the following manufacturers as indicated on the Drawings:

1. Notifier
2. SimplexGrinnell
3. Siemens-Cerberus Division.
4. Edwards System Technology.
5. Gamewell-FCI
6. Fike
7. Farenhyt
8. Approved Equal

- a. Approved equals will not be considered unless formally submitted during the bidding process as an RFI.

2.2 FIRE ALARM SYSTEM CONTROL PANEL

- A. The Fire Alarm System shall be a microprocessor-based system designed specifically for Fire applications. The System shall be UL listed under Standards 864 (Control Units for Fire-Protective Signaling Systems). Modular construction with a surface mounted enclosure.
- B. Remote Annunciator: Provide supervised remote annunciator(s) where shown on the plans, including audible and visible indication of fire alarm by address, and audible and visible indication of system trouble and supervisory. Install in flush mounted enclosure.
- C. Power supply: Provide two separate and reliable power supplies. The control panel shall receive 120 VAC power via a dedicated branch circuit of the building's electrical system. Each shall have adequate capacity for the system. The fire alarm contractor shall submit battery calculations for review and approval. The calculations shall indicate each device and the load required in stand-by and alarm mode. The secondary power system shall be a battery-operated emergency power supply and charger with capacity for operating system in standby mode for 24 hours followed by alarm mode for 5 minutes.
- D. System Supervision: Automatically detects and reports open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification appliance circuits. Alarm, supervisory and trouble signals shall be monitored by the supervising station over a Digital Alarm Communicator Transmitter (DACT), or other approved method.

- E. Initiating Device Circuits: Provide circuitry, which meets the performance requirements during abnormal conditions, based upon the style and class of the circuitry selected. Initiating device circuits shall be Class B.
- F. Notification Appliance Circuits: Provide circuitry, which meets the performance requirements during abnormal conditions, based upon the style and class of the circuitry selected. Notification appliance circuits shall be Class B.
- G. Signaling Line Circuits: Provide circuitry, which meets the performance requirements during abnormal conditions, based upon the style and class of the circuitry selected. Signaling line circuitry shall be Class B.
- H. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts to provide accessory functions specified.
- I. Digital Alarm Communicator Transmitter: Electrically supervised, capable of transmitting alarm, supervisory and trouble signals over telephone lines to remote station receiver.
- J. Provide TROUBLE ACKNOWLEDGE, DRILL, and ALARM SILENCE switch.
- K. Control Panel: The control panel and remote annunciator panel shall have dedicated alarm, supervisory and trouble LED's and dedicated alarm, supervisory and trouble acknowledge switches.
- L. Lamp Test: Manual lamp test function causes each LED to function at fire alarm control panel.
- M. Drill Sequence of Operation: Manual drill function causes alarm mode operation as described above.
- N. Addressable systems shall have Silent Walk Test, History logging for a minimum of 400 events, 80 character LCD display.

2.3 SEQUENCE OF OPERATIONS

- A. Trouble Sequence of Operation: System or circuit trouble places system in trouble mode, which causes the following system operations:

1. Visible and audible trouble alarm indicated at fire alarm control panel.
 2. Visible and audible trouble alarm indicated at remote annunciator panel, if provided.
 3. Trouble signal transmitted to supervising station.
 4. Manual acknowledge function at fire alarm control panel silences audible trouble alarm; visible alarm is displayed until initiating failure or circuit trouble is cleared.
- B. Supervisory Sequence of Operation: The activation of any sprinkler valve tamper switch or duct-mounted smoke detector places system in supervisory mode, which causes the following system operations:
1. Visible and audible supervisory alarm indicated by address at fire alarm control panel.
 2. Visible and audible supervisory alarm indicated by address at remote annunciator panel, if provided.
 3. Supervisory signal transmitted to supervising station.
 4. Duct-mounted smoke detectors shall shutdown their respective unit upon detection of smoke and remain down until manually reset.
 5. Manual acknowledge function at fire alarm control panel and remote annunciator panel silences audible supervisory alarm; visible alarm is displayed until device is returned to its normal position/supervisory condition is cleared.
- C. Alarm Sequence of Operation: Actuation of an alarm initiating device places circuit in alarm mode, which causes the following system operations.
1. Audible notification appliances shall sound until silenced by the alarm silence switch at the control panel.
 2. All visible alarm notification appliances shall display a continuous synchronized pattern until reset by the Alarm Reset Switch.
 3. Alarm signal transmitted to supervising station.
 4. All air-handling systems that are monitored shall shut-down and remain down until the fire alarm control panel is reset.
 5. The alarm LED shall flash on the control panel and remote annunciator panel until the alarm has been acknowledged at the control panel/remote annunciator panel. Once acknowledged, this same LED shall latch on and the custom label for the address in alarm shall be displayed on the alphanumeric LCD readout. A

subsequent alarm received from another address after acknowledged shall flash the alarm LED on the control panel showing the new alarm information.

6. A pulsing alarm tone shall occur within the control panel until acknowledged.

2.4 INITIATING DEVICES

- A. Manual Pull Station: Provide semi-flush, non-coded type, double action manual pull station.
- B. Spot Smoke Detector (Photoelectric type): Device shall have visible indication of detector actuation, self-restoring, plug-in with an integral addressable module indicating the detector status. Photoelectric detectors shall have sensitivity between 0.5 and 3.5 percent/foot smoke obscuration.
- C. Duct Mounted Smoke Detector: Photoelectric detector along with a standard, relay or isolator detector mounting base. Provide for variations in duct air velocity between 100 and 4000 feet per minute. Protect the measuring chamber from damage and insects. Provide an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. Provide drilling templates and gaskets to facilitate locating and mounting the housing. Provide remote alarm LEDs and remote test stations as shown on the plans.

2.5 NOTIFICATION APPLIANCES

- A. Alarm Horn: Surface type fire alarm horn. Sound rating: 87 dB at 10 feet.
- B. Visible Alarm Notification Appliances (Strobes): Strobes shall be xenon or equivalent, unfiltered or clear filtered white light, a minimum intensity of 15/75 candela and as indicated on drawings, flash rate range from 1 to 3 Hz, a maximum pulse duration of 0.2 sec with a maximum duty cycle of 40%. Strobe shall meet all requirements of the Americans with Disabilities Act (minimum 75 cd as tested per UL 1971).

2.6 AUXILIARY DEVICES

- A. Waterflow Alarm Switches: Shall be provided by the Fire Sprinkler Installer and shall be wired complete and ready for use by the Fire Alarm System Installer. Switch shall have an adjustable delay to minimize false alarms due to fluctuations in water pressure.
- B. Gate Valve (Tamper) Switches: Shall be provided by the Fire Sprinkler Installer and shall be wired complete and ready for use by the Fire Alarm System Installer.

- C. Control Relay Module: Provide intelligent control relay modules. The Control Relay Module shall provide one form "C" dry relay contact rated at 2 amps @ 24 VDC to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware.
- D. Fire Department Key Box: Shall be by Knox Company. Shall be provided where indicated on the contract documents and as required by the Authority Having Jurisdiction.

2.7 FIRE ALARM WIRE AND CABLE

- A. Fire Alarm Power Branch Circuits: Building wire as specified in Division 26.
- B. Signaling Line, Initiating Device and Notification Appliance Circuits: Power limited fire-protective signaling cable, solid copper conductor, 300 volts insulation, suitable for temperature, conditions and location installed. Minimum wire size for initiating device circuits, control circuits and notification appliance circuits shall be determined by calculations and manufacturer's requirements or recommendations. Wire and cable shall be twisted and shielded if recommended by the system manufacturer. Initiating, notification, and control circuits shall be sized based on 20% additional power consuming devices. The conductors shall meet the requirements of NEC article 760.
- C. The type of cable chosen should be based on fire alarm system requirements, specification requirements and applicable code requirements. Consideration should also be given to the length of cable runs and potential interference.
- D. All wiring provided on this project shall be UL listed for the intended use. All wiring including wiring to existing modified devices and appliances shall be new.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall install, program, and test all new equipment identified in this contract and revise existing equipment as noted.
- B. The installation supervisor shall be on the job site during the entire installation. The installation supervisor shall maintain marked up copies of the drawings at the job site

showing as-built conditions. These drawings shall be updated daily and available for Owner review.

- C. The Contractor shall provide all required conduit and all associated hardware, and shall install (pull), connect, and test all cable for a complete fire alarm system. All wiring shall be installed in accordance with the guidelines of these specifications and documents as well as the NFPA codes and standards listed in these specifications.

3.2 INSTALLATION

- A. All wiring shall be installed in conduit. Minimum allowable conduit size shall be $\frac{3}{4}$ inch. The conduit shall be sized so that conduit fill does not exceed 75% of NFPA 70 maximum fill requirements. Cables in vertical risers shall not exceed 50% of NFPA 70 maximum fill requirements. Conduit installation shall be as required by the Contractor's layout and as described in these specifications. All conduit field routing shall be acceptable to the Owner. Routing not acceptable shall be rerouted and replaced without expense to the Owner.
- B. All wire, cable, conduit, and raceways shall be concealed in walls, ceiling spaces, electrical shafts or closets in finished areas except as specifically noted otherwise. Conduit and raceways may be exposed in unfinished areas or where specifically approved by the Owner.
- C. Except as otherwise specified or indicated on the drawings, all conduit shall be installed parallel or perpendicular to dominant surfaces with right angle turns made of symmetrical bends or fittings. Except where prevented by the location of other work, a single conduit or a conduit group shall be centered on structural members.
- D. Conduit shall be located at least six inches from hot water or steam pipes, and from other hot surfaces. Conduit shall not block access to any existing equipment or fixtures.
- E. All conduits and junction boxes shall be labeled as specified in Division 26 (red).
- F. All wiring shall be terminated at devices or panels using terminal connectors for screw type terminals. All terminal connectors for conductors shall be pre-insulated ring type or pre-insulated spade type. Pre-insulated terminal connectors shall include a vinyl sleeve, color coded to indicate conductor size. Pre-insulated terminal connectors shall include a metallic support sleeve bonded to the vinyl-insulating sleeve and designed to grip the conductor insulation.

- G. Mount end-of-line device in box with last device or separate box adjacent to last device in circuit for conventional hardwired class B initiating and notification appliance circuits.
- H. Conduit shall be securely fastened to all boxes and cabinets. Threads on metallic conduit shall project through the wall of the box to allow the bushing to butt against the end of the conduit. The locknuts both inside and outside shall then be tightened sufficiently to bond the conduit securely to the box. Conduit shall enter cabinets from the bottom and sides only.
- I. Install manual station with operating handle 48 inches above floor unless noted otherwise on drawings.
- J. Install ceiling mounted initiating devices in areas with exposed structure tight to underside of floor/roof deck.
- K. Install ceiling mounted visible and audible/visible notification appliances in areas with exposed structure to bottom of floor/roof structure or at 30 ft AFF, whichever is lower.
- L. Install ceiling mounted visible and audible/visible notification appliances in areas with finished ceilings flush with bottom of ceiling or at 30 ft AFF, whichever is lower.
- M. Install wall mounted visible and audible/visible notification appliances with visible element (strobe) between 80 inches and 96 inches above finished floor unless noted otherwise on drawings.
- N. Install wall mounted audible devices with the top of the device at least 90 inches above finished floor or 6 inches below the ceiling, whichever is lower, unless noted otherwise on Drawings. If combination devices are installed, they shall be installed per the visible signal device requirements.
- O. Make conduit and wiring connections to equipment provided by others.
- P. Provide strobe synchronization as required per NFPA 72.

3.3 FIELD QUALITY CONTROL

- A. Systems shall be checked and tested in accordance with the instructions provided by the manufacturer to ensure that the system functions as required and is free of

grounds, opens, and shorts. Each device shall be tested. Smoke detectors shall be tested with products of combustion.

- B. Upon completion of the system installation and before the Date of Final Acceptance, a factory-trained technician shall perform all necessary tests and adjustments and shall then file a Letter of Certification and a Certificate of Completion (NFPA 72) with the Owner indicating that the system functions and conforms to the Fire Alarm System Specifications.
- C. Test in accordance with NFPA 72 and local fire department requirements.

3.4 MANUFACTURER'S FIELD SERVICES

- A. Include services of factory trained and certified technician to supervise installation, adjustments, final connections, and system testing as performed by the fire alarm contractor's factory-trained technicians.

3.5 DEMONSTRATION

- A. The equipment supplier's factory trained technician shall train the Owner's personnel in the proper use and maintenance of the system. Training sessions shall be conducted as needed, not to exceed a total of 2 sessions, with each session lasting a maximum of 4 hours each.
- B. Demonstrate normal and abnormal modes of operation, and required responses to each.

3.6 ACCEPTANCE TESTING

- A. Upon completion of the system installation, a factory-trained technician shall perform all necessary tests and adjustments in the presence of the Owner's designated personnel.

END OF SECTION 281111

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SECTION 281600 - INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contractor shall provide, install, and program a functionally complete, integrated Digital Alarm Communicator (DACS) per Manufacturer's guidelines, codes described, within these specifications.
- B. Work included under this section:
 - 1. System and its components
 - 2. System Wiring (low voltage)
 - 3. Mounting Accessories
 - 4. System Programming
 - 5. Warranty, Service & Training
- C. Related work specified under other sections of these specifications (Related sections)
 - 1. Power (120 VAC)
 - 2. Raceways
 - 3. Door Hardware (Electric Locks)

1.2 GENERAL CONDITIONS

- A. Submittals
 - 1. Drawings: Shop drawings to provide details of proposed system and the work to be provided. These include point-to-point drawings of systems and wiring diagrams of individual devices.
 - 2. Permits: The Contractor shall be responsible for identifying requirements for permits from the local police department for the installation of the alarm system specified herein and shall assist the owner in obtaining the relevant alarm permits.
- B. Operation and Maintenance Manuals
 - 1. "As-builts": Upon completion of installation, the Contractor shall prepare "as-built" drawings of the system. These "As-builts" shall be 30 in. x 42 in. (76 cm x 107 cm) format mylar reproducible drawings of each floor plan indicating exact device locations, panel terminations, cable routes and wire numbers as tagged and color-coded on the cable tag.
 - 2. Additionally, final point-to-point wiring diagrams of each type of device (on 30 in. x 42 in. or 76 cm x 107 cm format) shall be included in the "as-builts."
 - 3. "As-builts" shall be submitted to the Owner for approval prior to the system acceptance walkthrough.

4. The operation and maintenance manual shall include alarm panel phone numbers, type and model of fire alarm panel, list of zone numbers with a detailed description per zone.
 5. The fire alarm system installer shall verify that each alarm signal from each zone sends an alarm signal to the Academy monitoring company.
 6. Operation and maintenance manuals: Three (3) sets of operating manuals shall be provided explaining the operation and maintenance of the system.
- C. On-site security personnel training - The Contractor upon completion of installation shall furnish training in the complete operation of the systems.
- D. System approvals
1. The system shall be the standard product of one manufacturer, and the manufacturer shall have been in business manufacturing similar products for at least 5 years.
 2. After-sales support: The Contractor shall be a factory-authorized and trained dealer of the system and shall be factory-trained and certified to maintain/repair the system after system acceptance.
- E. Quality assurance - All equipment, systems, and materials furnished and installed under this section shall be installed in accordance with the applicable standards of:
1. National codes: NEC, NFPA, UBC, BOCA, SBCCI
 2. Approvals and listings: UL, FM, (ANSI CP-01, CSFM, NYC-MEA, when applicable)
 3. Local Authorities Having Jurisdiction
- F. Warranty - All components, parts, and assemblies supplied by the Manufacturers and installed by the Contractor shall be warranted against defects in material and workmanship for a period of at least 12 months (parts and labor), commencing upon date of acceptance by Owner. A qualified factory-trained service representative shall provide warranty service.
- G. Service/Maintenance
1. System maintenance and repair of system or workmanship defects during the warranty period shall be provided by the Contractor free of charge (parts and labor).
 2. Periodic testing of the system shall be carried out on a monthly or quarterly basis to ensure the integrity of the control panel, the sensing devices, and the telephone lines.
 3. The installer shall correct any system defect within six (6) hours of receipt of call from the Owner.
 4. Extended service/maintenance agreements shall be offered by the Contractor for up to four years after the warranty expires. The agreement shall be renewable monthly, quarterly, or yearly.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. The DACS specified herein shall include a Digital Alarm Communicator Transmitter (DACT), built-in telephone line monitor, up to 1000 event memory logger, real time clock, calendar, test timer, battery charging / voltage supervision circuitry, battery lead supervision, diagnostics displays, time / event-based scheduling system, lightning / EMI protection circuits, and the associated optional modules and components for a complete DACS. Refer to section 2.4 Materials on 8 for detailed hardware requirements and specifications.
- B. The DACT firmware shall support programmable "software" features as detailed in section 2.2 SYSTEM FEATURES/CAPABILITY SUMMARY. The following describes the general functional requirements of the DACS:
 - 1. The DACS shall support the connection and reporting of intrusion devices to a remote Digital Alarm Communicator Receiver (DACR).
 - 2. The DACS shall provide identification, annunciation, and communication of alarmed detectors by point and each access control user by number.
 - 3. The DACS shall be capable of segregating the points (i.e., a detector or group of detectors zoned together) into separate, independent "areas."
 - 4. The DACS shall be "modularly" expandable using hard-wired address identification modules.
 - 5. The DACS shall have electrically supervised detection loops and power supplies (mains and battery(s)). This supervision shall be programmable for the purposes of reporting this information to the DACR.
 - 6. The DACS shall be capable of monitoring and switching to active telephone lines when trying to establish communications with the DACR and transmitting a report.
 - 7. The DACS shall be capable of reporting and communicating alarm or trouble event data by reporting to one, two, three or four off-site remote DACRs via dial-up analog telephone lines or over a local or wide area network using a network interface module.
 - 8. The DACS shall be capable of sending (manually or automatically) test and status reports to remote DACRs.
 - 9. The DACS shall be programmable locally or remotely. Programming shall be accomplished via a portable programmer or a computer running the Remote Programming Software (RPS). Users shall be capable of changing their own user passcode from the Alarm Command Center (ACC) and managers shall be capable of changing the user passcodes and authority assignments by area of other users from the ACC.
 - 10. The DACS shall annunciate alarm, trouble, service reminders, and other relevant system status messages in custom English text at the ACC.
 - 11. The DACS shall be capable of executing diagnostics and testing functions locally or remotely.
 - 12. The DACS shall be capable of activating 128 (64 with the D7412GV2) relays and three additional outputs for auxiliary functions based on its classifications (area vs. panel wide).
 - 13. The DACS shall be capable of controlling relays and automatically executing system functions based on a time / event scheduling program. The program can

be hour, day of week or day of month based. Each scheduled event can be exclusive of one of four holiday date definitions that can include one to 365 selected Julian dates. The following functions can be executed:

- a. Arm / Disarm a specific area.
 - b. Bypass / Unbypass a point.
 - c. Activate / Deactivate a relay.
 - d. Send a test report.
 - e. Adjust system clock for daylight savings time.
 - f. Turn an Access Authority Level On / Off.
 - g. Turn recording of Access Granted events On / Off (and transmittal if routing is ON).
 - h. Turn recording of Access Denied events On / Off (and transmittal if routing is ON).
14. The DACS shall be capable of listening to calls answered by other devices on the premises side of the phone line and determining if a special tone is being sent from the incoming call (Remote Account Manager) and intercepting the call for Remote Account Manager sessions.
15. The DACS shall be capable of controlling up to eight separate doors using and providing entry to authorized users based on authority assigned to the user by the area into which the door enters. The DACS shall use not less than 24 bits of card/token specific data to identify the user. This card data shall not be truncated or shortened in making the identification of the user.

2.2 SYSTEM FEATURE/CAPABILITY SUMMARY

- A. General - The following indicates system software/hardware capabilities, capacities, and formats:
- B. Number of Loops/Sensors: 246 (75 with the D7412GV2) separately identifiable points, of which 8 are on-board loops and 238 (67 with the D7412GV2) are off-board addressable points / zones connected to multiplexed backbone trunks. Each of the points shall be capable of supporting "group zoning." Group zoning refers to the combining of sensors into a separately identifiable and separately annunciated (programmable text) area.
- C. Programming Point Functionality: Each point in the system shall provide for the following type of response in the system.
1. Always on (24-hour response)
 2. On when the system is Master Armed
 3. Only on when the system is Perimeter Armed
 4. Displays / Does Not Display at the ACC when the point is activated.
 5. Provides / Does Not Provide entry warning tone.
 6. Sounds / Does Not Sound audible alarm indication.
 7. The Point is bypassable / not bypassable.
 8. Alarm Verification with programmable verification time
 9. Relay activation by Point
 10. Provides / Does Not Provide "watch point" capability.
 11. Provides Swinger Bypass
 12. Defers Bypass Report

13. Can return to the system after being force armed and then restoring.
14. Can return to the system after being bypassed and then restoring.

- D. Areas/Accounts: The DACS shall support 8 independent areas. Each of the eight (8) areas shall have custom text associated with the armed state, disarmed state and point-off-normal state. Additionally, the DACS shall be capable of assigning 1 to 8 account identifiers to the areas depending on the distribution of areas per account. Each and all of the eight areas must be capable of Master and/or Perimeter arming (excluding predefined Interior protection).

The DACS shall be capable of logically grouping 2 or more points into an area, or conversely, dividing the points into two or more areas. Any area shall be configurable to allow arming by specific users when a programmable number of devices are faulted or bypassed.

Areas shall be independently controlled by their corresponding ACC. Each ACC can be designated to control a specific area, or group of areas, or all areas in the system.

Independent control or relay functions by area shall be possible through programming assignments.

- E. Number of Alarm Command Centers: 32 Unsupervised ACCs, each capable of displaying custom English text on vacuum fluorescent displays and sounding different patterns of audible alarm for different events, shall be required. Up to Eight (8) ACCs can be supervised at one time. An ACC can be programmed to respond to the entry of any of the specifically authorized 250 (100 with the D7412GV2) user passcodes (followed by the [ENT] key) and cycle an assigned access control door using a connected door controller. The event is logged and transmitted (if routing is ON) to the DACR including door and user identity.
- F. Number of User Passcodes: Up to 249 (99 with the D7412GV2) different passcodes shall be required. Each passcode shall be three (3) to six (6) digits (variable) and be assigned a 16-character username that shall be printed on the local printer and DACR with associated opening and closing reports from the user. Passcodes shall be enabled or disabled by area(s) and shall be assigned one of fourteen (14) different authority levels to carry out functions such as the activation of relays from the ACC. These passcodes shall also be required for carrying various system functions such as arming the system, disarming the system, transmitting a duress code, resetting the system and silencing sounders. A single user passcode shall be able to be used in each of the 8 areas with potentially a different authority level in each area.

Each of the 249 (99 with the D7412GV2) different passcodes shall be able to be associated with 4 individual access cards/tokens. The authority of any of the four cards assigned to the user will be that of the user, but each card will report in the display, local printer, memory event log and at the DACR as a separate user / sub-user number pair.

- G. Number of Access Controlled Doors: Up to 8 (2 with the D7412GV2) doors, each connected to a door controller module that is subsequently connected to the DACS. Each door controller is programmed through the DACS from the local programmer or the RPS and can be configured independently from other doors. Each door contact is

supervised and is wired to the door controller and can use normally open or normally closed contacts. The door lock can be programmed to reset the door strike time when the door either opens or closes. The door opening can terminate a programmable door buzzer. The door contact is shunted when valid access is being granted through the door. A request to exit and a separate request to enter supervised input is provided on the door controller. A programmable feature provides for door shunting on request to exit without activating the lock output. An optional buzzer can be sounded, and an ACC can display a door closing warning if the door is held open beyond a programmable time. The door can be programmed to activate an alarm or trouble in the door left open condition. The DACT shall be capable of transmitting the Door Left Open indication to the DACR. The door strike shall be capable of being programmed to automatically unlock if the area is completely disarmed and will not automatically unlock if the area is selectively disarmed. The DACS shall be capable of being programmed, on a time basis, to record access granted and or access denied events by door.

- H. Access Control / User Features: The DACS shall allow each authority profile to specify whether users holding that authority are to be granted access into the area based on whether the area is completely disarmed, perimeter armed or completely armed. Additionally, the DACS shall be able to automatically disarm the area or convert the arm state of the area from fully armed to perimeter armed based on the authority level assigned to the user and area or arm an area from a particular reader. Assigned users shall be able to manually control the door from an ACC by setting the door to Normal Operation, Manually Locked or Secured (valid cards will not operate).
- I. Communication Formats: The Radionics Modem IIIa2 communications format shall be utilized for optimum system performance. The DACT shall report to a Commercial Central Station using a Bosch Security Systems D6500 or D6600 Alarm Receiver that supports the Radionics Modem IIIa2 communications format. One such advantage is point identification information transmission to DACRs (Alarms, Troubles and Restorals by point). Others include actual point number; point text; actual user number, username; by-passed points; relay activation; opening/closing reports by users; late, early, or fail opening/closing reports, and opening/closing reports by area.
- J. Testing, Diagnostic, and Programming Facilities: Automatic test reports and remote system access for diagnostics, programming, and log (Logger) uploads shall also be supported via a remote central station computer utilizing the RPS software.
- K. Logger Capacities and Formats: Up to 1000 events indicating time, date, type of event, account number, area number, user ID, point text, user text and primary/secondary event route each event. Logs shall be viewed locally at the ACC and remotely via an upload to a computer running the RPS software. The DACS shall also support the printing of these events on up to three local printers. The DACS shall also send a report to the DACR when the log reaches a programmable "percent full capacity" so that RPS can retrieve the stored events. Group, signal type and area can route events to specific printers.
- L. Reports: Reports to DACRs at commercial central stations as a result of system supervision shall include alarm, trouble, missing modules, restoral, system status, AC failure and low battery. The DACS shall also transmit test reports once every 24 hours. CPU failure shall be annunciated locally. The ACCs should display the following information for the indicated system supervisory conditions:

1. Call for Service
2. Service Panel
3. Service Param
4. Service AC Fail
5. Service Battery Low
6. Service Battery Missing
7. Service Communications Failure
8. Service Keypad
9. Service Route
10. Service Printer
11. Service Point Buss Failure

M. Telephone Lines, IP Addresses, and "Phone Routing": The DACS shall support one (1) or two (2) telephone lines that are to be alternated for the transmission of consecutive events. The DACS shall have the capability of communicating with up to eight (8) different DACRs (4 different phone numbers) and/or four (4) different IP Addresses. Each Phone Number can be up to 24 digits long. The DACS reports shall be classified, by event, into eleven (11) subcategories or "report groups." Each group represents similar types of events. Individual events within each group shall be selectively enabled or disabled to be transmitted. Each DACR shall be designated as a primary, backup, or duplicate destination for each report group. Assigning an event to multiple routing groups provides for duplicate destination for the event. The transmission of events allows the reporting of different types of information to different remote DACRs. The eleven report groups shall be as follows:

1. Fire Reports
2. Burglar Reports
3. User Reports
4. Test Reports
5. Diagnostic Reports
6. Relay Reports
7. Auto Function Reports
8. RPS Reports
9. Point Reports
10. User Change Reports
11. Access Reports

N. Number of Programmable Relay Output Modules: 8 relays (Form C) are to be provided per octo-relay module for a total of 128 (64 with the D7412GV2) relays plus three additional outputs per DACS. These multi-purpose modules are programmable and shall be used to implement auxiliary functions (manually or automatically). There are up to 128 outputs available on the D9412 and 64 outputs on the D7412 for the relay follows point function. Relays and other outputs may be programmed to follow up to 14 different area conditions or up to 12 panel conditions. Relays may also be programmed to follow individual points or groups of points.

O. Number and Alarm Output Selections: Four (4) different types of alarm output selections shall be supported by the DACS: Steady, Pulsed, California Standard, and Temporal Code 3. The system can be configured to provide zoned indication of alarm conditions.

- P. Miscellaneous Features: Programmable alarm output timer, 31 programmable entry delay times, exit delay programmable by area, individually programmable point of protection text, point bypassing, and key-switch arming capability with LED outputs.
- Q. Real-Time Clock, Calendar, and Test Timer: The DACS shall incorporate an integral real-time clock, calendar, and a test timer.
- R. Opening and Closing Windows: The system shall be programmed with "normal" opening and closing periods for each day of the week and thus suppress scheduled opening / closing reports and report only the exceptions, i.e., opening / closing outside the pre-defined time window. The DACS shall have the capability to suppress opening / closing reports, overriding the programmed open / close windows during holidays and automatically arming the DACS (by area) at the end of the closing period.
- S. DACS Power Ratings: The DACS shall provide 1.4 amps of auxiliary power and 2 amps of alarm power, both rated at 12 VDC.
- T. DACS Fault Detection: The DACS shall check the point sensor loops once every 300 milliseconds. The point response time is programmable over a range of 300 milliseconds to 4.5 seconds.
- U. The DACS shall incorporate a programmable "Passcode Follows Scope" feature that can be programmed to allow users to arm or disarm only the area they are entering with one simple command or control all areas from one keypad.
- V. The DACS shall include an early ambush feature that requires that the user disarm, and then inspect the facility within a specified time period, before entering their passcode again. If the user does not enter their passcode a second time, a duress event is generated. If the end user does enter their code within the specified time period, the system disarms. In addition, the system must have a programmable feature that requires that two passcodes are entered to disarm the system. After one code is entered, the system will prompt for a second code.
- W. User-Programmable Features: The DACS shall provide a menu driven interface to provide a user-friendly command structure for programming / customizing the system to the operational criteria of the application. The DACS shall be capable of being operated via:
 - 1. The Command Structure
 - 2. Menu / Command List
- X. Shall be able to intelligently integrate with Bosch Security Engine Building Automation Software, Bosch Readykey PRO Access control systems, and/or Bosch DiBos Digital Video Recorders.
- Y. Shall be able to connect to one parallel printer (D7412GV2) to the DACTS. These system features shall have restrictions based on 14 individually programmable levels of passcode authority that can be assigned to system users. The user's passcode shall have the capability of being assigned a different authority level in each of the eight (8) areas. A service passcode can be assigned to the servicing agent allowing the agent limited access to system functions. User-programmable / activated functions include:

1. Arming the system: All areas, specific area(s) only, perimeter instant, perimeter delayed, perimeter partial, watch mode, and arming the system with a duress passcode.
2. Disarming the system: All areas, specific area(s) only and disarming with a duress passcode.
3. Viewing system status: Faulted points, event memory, bypassed points, area status and point status.
4. Implementation functions: Bypass a point, unbypass a point, reset sensors, silence bell, activating relays, initiating the remote programming function locally to allow programming the system from a remote location. The ACCs can also be temporarily readdressed to view the status of a remote area.
5. Testing the system: Local Walk test, Service Walk test, Fire test, send report to remote DACR to check the telephone link, and programming the time and date for the next test report transmission.
6. Change system parameters: ACC display brightness, system time and date, and add/delete/change passcodes.
7. Extend the closing time of system.
8. Transmitting special alerts and activating audible and visible signals.
9. Executing multiple commands / ACC keystrokes from a single Menu / Command List item. This function shall be able to have a 16-character (alphanumeric) title to identify it on the ACC display.
10. Editing of time / event-based scheduling program from the ACC.
11. The DACS shall also provide a "service menu" to implement functions such as viewing and printing the system log, displaying the system firmware revision number, and defaulting (toggling) text displays between custom and default text displays for troubleshooting.

2.3 SYSTEM INTERFACE REQUIREMENTS

- A. Grounding: The Contractor shall properly earth ground the DACS to prevent electrostatic charges and other transient electrical surges from damaging the DACS panel.
- B. Primary power: The Contractor shall provide a dedicated 120 VAC power circuit to the DACS system. This circuit shall be connected to the emergency power system. The 120 VAC is stepped down to 16.5 VAC to power the DACS panel using a class two, plug-in transformer. This power circuit shall be properly rated to continuously power all points and functions indefinitely in full alarm condition.
- C. Primary power supervision: When the primary power source fails, the system can be configured to report an "AC Fail" message to a commercial central station. The transmission delay of this message is programmable from 5 seconds to 86 minutes with an optional 6-to-12-hour transmission delay. The message can also be programmed to "tag-along" with another message transmitted to the central station. The system will always display a loss of primary power on the ACC and may be configured to provide additional audible warning.
- D. Secondary power (standby battery): The Contractor shall provide adequate battery power as defined by the relevant application criteria, (UL 864 and 985 for alarm installations or NFPA 72 chapters for fire applications). Appropriate battery chargers shall be provided consistent with the battery back-up capacity. The most current

accepted version of NFPA 72 and any applicable local codes or AHJ requirements must be met accordingly.

- E. Secondary power supervision: When the secondary power source experiences a 85% depletion of its standby capacity, the system can be configured to report a "Low Battery" message to a commercial central station. The system will always display a low battery condition on the ACC and may be configured to provide additional audible warning.
- F. Wiring: The contractor shall provide cables consistent with the manufacturer's recommendations. The following general guidelines shall be followed for wiring installation:
 - 1. Wiring shall be appropriately color-coded with permanent wire markers. Copper conductors shall be used.
 - 2. All signal cables provided under this contract shall be Class II, plenum-rated cable where required. Where subject to mechanical damage, wiring shall be enclosed in metal conduits or surface metallic raceway.
 - 3. Data wires shall not be enclosed in conduit or raceways containing AC power wires.
 - 4. Where EMI may interfere with the proper operation of the DACS circuits, twisted/shielded cable shall be used.
- G. The DACS shall be protected from EMI and lightning surges.
- H. Telephone interface: The DACS shall be equipped with a phone line monitor and shall interface with the phone lines via RJ-31X jacks for supervision of the telephone line connection to the DACS panel. When a telephone line is determined to be out of service by the DACS panel, the event will be annunciated locally on the ACC and transmitted to the central station. The transmission delay of this message is programmable from ten (10) to two-hundred forty (240) seconds. A telephone line switching modules shall be used to interface to a second telephone line. This interface shall conform with FCC rules part 15 and 68.
- I. Ethernet access: The DACS may use an Ethernet interface module as the primary means of communicating to a DACR. Up to four IP Addresses shall be available to route system events to. A programmable supervision time of 5 to 65,535 seconds shall be required. This module may be programmed for 128-bit AES encryption if required.
- J. Auxiliary function control interfaces: Auxiliary functions such as activating bells, strobes, or lights shall be accomplished using the optional relay modules. These auxiliary interfaces shall be electrically isolated to avoid inter-system interferences or damages.
- K. Functional criteria programmed into system memory shall be backed up by battery power. Additionally, the number of system programmers shall be severely restricted via the use of program locking features and passwords.

2.4 MATERIALS

- A. The DACS control panel shall be Bosch Security Systems model D7412GV2. The DACS shall be provided, at minimum, with the following components. Additional accessories shall be provided based on the quantities and features required for the application.
1. Enclosure – D8101A Attack Resistant
 2. Lock and key
 3. Power transformer
 4. Manuals
- B. System Accessories:
1. D8125: Point of Protection EXpander module. Each POPEX (up to two per system) shall monitor up to 119 Popit devices
 2. D8128D: Octo-POPIT module – combines POPEX and POPIT functions and provides 8 points to each DACS. A total of 30 OctoPOPITS per DACS
 3. D9127U: Point of Protection Input Module, Un-tampered
 4. D8128: Octo-Relay Module – Eight relay module with 8 form C Relays
 5. D1260B: ATM Style Alpha Command Center w/LCD display, white and Gray modern case
 6. D8004: Transformer Enclosure
 7. D122: Dual Battery Harness
 8. GE200B: GE Glass Breakage Detector, 25 ft. (8 m)
 9. SR2202AU: Surface Mount Overhead Door Contact with armor protected cable
 10. SR1078CN: ¾" recessed contacts for Front Sliding Store Front Doors
 11. DS835: Wall mounted PIR/Microwave Detector, 35 ft. (11 m)
 12. DS939: Ceiling Mount Panoramic PIR Detector, 70 ft. (20 m)
 13. ELK-SS30: Indoor 30 Watt Siren
 14. SSX51SL1B: Amseco Exterior Siren and Strobe Combo w/Blue Strobe
 15. SR2700: Surface Mount Man Door Contact with armor protected cable (single pole doublethrow)
- C. Power Supply:
1. AL600ULX: UL - 12 V auxiliary Power Supply. Combined with external batteries, increases standby time and provides additional power to auxiliary devices and motions
 2. UB1280: 12 Volt 8 AmpHr Sealed Lead Acid Battery
- D. Communication Accessories:
1. RJ31X: Telephone interconnection Block
 2. DX4020: Ethernet Interface Module for G Series Panel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all equipment and materials in accordance with the "current" recommendations of the manufacturer. The work shall also be in accordance with:
 - 1. Installation criteria defined in these specifications and in the construction documents.
 - 2. Factory Representative can be the Bosch Security Systems Security Dealer.
 - 3. Approved submittals.
 - 4. Applicable requirements of referenced standards.

3.2 SUPERVISION

- A. The contractor shall provide the following services as part of the contract:
 - 1. Supervision of sub-contractors.
 - 2. Coordination of other contractors for system-related work (electrical contractor, finish hardware contractor, architect, and general contractor).
 - 3. Attending site construction/coordination meetings.
 - 4. Keeping updated construction drawings at the construction site.
 - 5. Meeting construction deadlines per the construction schedule.

3.3 PROGRAMMING

- A. Programming of the system shall include the following tasks:
 - 1. Programming system configuration parameters (hardware and software, zone/circuit numbers, communication parameters).
 - 2. Programming operational parameters such as opening/closing reports and windows, system response text (custom English) displays of events, activation of relays that drive auxiliary devices, and identifying types of zones/loops.
 - 3. Programming passcodes according to the authorities and functions defined by the owner.
 - 4. Other system programming tasks required by the owner. These additional programming Requirements shall be coordinated between the owner and the contractor.

3.4 TESTING

- A. Operational Testing: The contractor shall perform thorough operational testing and verify that all system components are fully operational.
- B. Hard-copy System Printout: The contractor shall submit a hard-copy system printout of all components tested and certify 100 percent operation indicating all devices/panels/units have passed the test criteria set forth by the manufacturer.
- C. Acceptance Test Plan Form: An acceptance test plan form shall be prepared/provided by the contractor prior to the acceptance walk-through.

- D. This form shall include separate sections for each device/panel/unit as well as a column indicating the manufacturer's performance allowance/margin, a column indicating the result of the testing performed by the contractor (pass/fail), and an empty column for recording findings during the walkthrough.
- E. Fire Alarm Systems shall comply with NFPA 72 Standards for inspection, testing, and maintenance.

3.5 COMMISSIONING

- A. The contractor shall certify completion in writing and schedule the commissioning walk-through. The contractor shall provide all the tools and personnel needed to conduct an efficient commissioning process.

END OF SECTION 281600

SECTION 285100 - TESTING REQUIREMENTS AND COMPLETION FORM

REFER TO SECTION #	TEST TO PERFORM	WHO SHALL PERFORM TEST	DATE TEST PERFORMED AND PASSED
280500.1.8.A	Provide labor and materials required to install, test and place into operation the Electronic Safety and Security System as called for in the Contract Documents, and in accordance with applicable codes and regulations. Labor, materials, or accessories not specifically called for in the Contract Documents, but required to provide complete, operating systems shall be provided without additional cost to the Owner	Electronic Safety and Security System Contractor	
280500.2.1.J	Where factory testing of equipment is required to ascertain performance and attendance by the Owner's representative is required to witness such tests, associated travel costs and subsistence shall be paid for by the Contractor	Manufacturer	
280500.3.2.A.3	Test Reports: 1. Pre-Installation Testing Reports: Submit two sets of manufacturers' or field-testing reports for those materials identified in the individual system Specification Sections as requiring that such reports be submitted 2. Post-Installation Testing Reports: See Specification Sections in Division 26	Electronic Safety and Security System Contractor	
280500.3.15.A	Adjust, align, and test all Electronic Safety and Security System equipment furnished and/or installed under this Division	Electronic Safety and Security System Contractor	
280500.3.15.B	Check and test protective devices for specified and required application, and adjust as required	Electronic Safety and Security System Contractor	
280500.3.17.E	Upon completing each test, record the results, date and time of each test and the conditions under which the test was conducted. Submit to the Architect, for Engineer's review, in duplicate. Supply all test results required by Division 28 specifications	Electronic Safety and Security System Contractor	
280500.3.20.A.5	Perform start-up tests of all systems	Electronic Safety and Security	

280500.3.23.C	Upon receipt of the Contractor's documentation of cable testing, the Owner will review/observe the installation and randomly request tests of the cables/wires installed. Once all cables required by these construction documents have been tested and pass in accordance with sections in Division 28 and the Owner is satisfied that all work is in accordance with the Contract Documents, the Owner will notify the Contractor in writing that the work has been accepted	Electronic Safety and Security System Contractor	
280513.1.6.A	Test cables upon receipt at Project site.	Electronic Safety and Security System Contractor	
280513.1.6.A.1	Test each pair of UTP cable for open and short circuits after installation	Electronic Safety and Security System Contractor	
280513.3.7.B.3	Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.	Electronic Safety and Security System Contractor	
280513.3.7.B.4	Coaxial Cable Tests: Comply with requirements in Division 27 Section "Master Antenna Television System."	Electronic Safety and Security System Contractor	
280513.3.7.C	Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit	Electronic Safety and Security System Contractor	
281111.3.1.A	The Contractor shall install, program and test all new equipment identified in this contract and revise existing equipment as noted	Fire Alarm Contractor	
281111.3.3.A	Systems shall be checked and tested in accordance with the instructions provided by the manufacturer to insure that the system functions as required and is free of grounds, opens, and shorts. Each device shall be tested. Smoke detectors shall be tested with products of combustion	Fire Alarm Contractor	
281111.3.3.B	Upon completion of the system installation and before the Date of Final Acceptance, a factory-trained	Fire Alarm Contractor	

	technician shall perform all necessary tests and adjustments and shall then file a Letter of Certification and a Certificate of Completion (NFPA 72) with the Owner indicating that the system functions and conforms to the Fire Alarm System Specifications		

281111.3.3.C	Test in accordance with NFPA 72 and local fire department requirements	Fire Alarm Contractor	
281111.3.6.A	Upon completion of the system installation, a factory trained technician shall perform all necessary tests and adjustments in the presence of the Owner's designated personnel	Fire Alarm Contractor	
281600.3.4	A. Operational Testing: The contractor shall perform thorough operational testing and verify that all system components are fully operational. B. Hard-copy System Printout: The contractor shall submit a hard-copy system printout of all components tested and certify 100 percent operation indicating all devices/panels/units have passed the test criteria set forth by the manufacturer. C. Acceptance Test Plan Form: An acceptance test plan form shall be prepared/provided by the contractor prior to the acceptance walk-through. D. This form shall include separate sections for each device/panel/unit as well as a column indicating the manufacturer's performance allowance/margin, a column indicating the result of the testing performed by the contractor (pass/fail), and an empty column for recording findings during the walk-through.	Intrusion Detection System Contractor	
281600.3.5	The contractor shall certify completion in writing and schedule the commissioning walk-through. The contractor shall provide all the tools and personnel needed to conduct an efficient commissioning process	Intrusion Detection System Contractor	

END OF SECTION 285100

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SECTION 285200 - O & M REQUIREMENTS AND COMPLETION FORM

REFER TO SECTION #	O & M REQUIRED INFORMATION	DATE O & M MANUALS DELIVERED/TASK COMPLETED
280500.1.14.B	Submit data prior to requesting the final punch list and before all requests for Substantial Completion	
280500.1.14.C	Instruct the Owner's permanent personnel in the proper operation of, startup and shutdown procedures and maintenance of the equipment and components of the systems installed under this Division	
280500.1.14.D	Prior to Substantial Completion of the project, furnish to the Architect, for Engineer's review, and for the Owner's use, four (4) copies of brochures in three-ring, loose-leaf, hard-back notebook form, divided and tabbed, containing equipment data, approved submittals, shop drawings, diagrams, capacities, spare part numbers, manufacturer's service and maintenance data, warranties, guarantees, etc. Include local contacts complete with address and telephone number, for equipment, apparatus, and system components furnished and installed under this Division of the specifications	
281111.1.7.D	Include in the O&M manual a copy of the service representative's contact list with all applicable phone and pager numbers	
281111.1.7.E	The operation and maintenance manual shall include alarm panel phone numbers, type and model of fire alarm panel, list of zone numbers with a detailed description per zone	
281111.1.7.F	The fire alarm system installer shall verify that each alarm signal from each zone sends an alarm signal to the Academy monitoring company	
281600.1.2.B.1	"As-builts": Upon completion of installation, the Contractor shall prepare "as-built" drawings of the system. These "As-builts" shall be 30 in. x 42 in. (76 cm x 107 cm) format mylar reproducible drawings of each floor plan indicating exact device locations, panel terminations, cable routes and wire numbers as tagged and color-coded on the cable tag	
281600.1.2.B.2	Additionally, final point-to-point wiring diagrams of each type of device (on 30 in. x 42 in. or 76 cm x 107 cm format) shall be included in the "as-builts"	
281600.1.2.B.3	"As-builts" shall be submitted to the Owner for approval prior to the system acceptance walk-through	

END OF SECTION 285200

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