

**Attachment C-**

**Division 2- Technical Specifications**

SECTION 000110  
TABLE OF CONTENTS

**DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS:**

000110	Table of Contents
000115	List of Drawings
002113	Instructions to Sellers
002114	Diesel Engine Emissions Controls for PW Bids
002115	Notice to Sellers ONLY-Mayor's Executive Order 7-14
004109	Pricing
004112	Performance of Work
004312	Public Works LBE Language
004313	Bid Bond
007200	Standard Contract Requirements
007201	Act 127 Verification Form Addendum
007337	REBUILD Economic Opportunity Plan (EOP)
007343	Prevailing Wage Rates Schedule

**DIVISION 1 - GENERAL REQUIREMENTS**

011100	Summary of the Work
012500	Substitution Procedures
012600	Contract Modification Procedures - Change Order Form
012900	Payment Procedures
012973	Schedule of Values
013113	Project Coordination
013119	Project Meetings
013216	Construction Scheduling
013226	Progress Reports
013233	Construction Photographs
013330	Submittals
013513.18	Special Requirements for Work Within the Philadelphia Parks & Recreation System
014100	Codes, Regulations and Standards
014516.13	Contractor's Quality Control
015000	Temporary Facilities and Controls
015639	Temporary Tree and Plant Protection
015719	Environmental Controls
015800	Project Identification and Signs
016001	Products and Materials
017123	Field Engineering
017329	Cutting, Patching, Sleeves and Inserts
017419	Construction Waste Management and Disposal
017423	Cleaning
017700	Closeout Procedures -Certificate of Substantial Completion Form
017823	Operation and Maintenance Manuals
017836	Warranties
017839	Project Record Documents

**DIVISION 2 – EXISTING CONDITIONS**

02 4119	Selective Demolition
02 8200	Removal of Asbestos Containing Materials

**DIVISION 3 – CONCRETE**

03 0130	Maintenance of Cast in Place Concrete
03 3000	Cast-in-Place Concrete
03 4900	Glass-fiber Reinforced Concrete Castings

**DIVISION 4 - MASONRY**

04 0120	Masonry Repairs
04 0122	Masonry Cleaning
04 0200	Exterior Stone Cladding

**DIVISION 5 – METALS**

05 5000	Metal Fabrications
05 5100	Metal Stairs
05 7300	Decorative Metal Railings

**DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES**

06 1053	Rough Carpentry
06 1516	Wood Roof Deckings
06 1600	Sheathing
06 1610	Magnesium Oxide Interior Wall Panels
06 4023	Interior Architectural Woodwork

**DIVISION 7 – THERMAL AND MOISTURE PROTECTION**

07 0150	Preparation for Re-Roofing
07 4100	Preformed Metal Standing Seam Roofing
07 5216	SBS Modified Bituminous Membrane Roofing
07 6200	Sheet Metal Flashing and Trim
07 7100	Manufactured Roof Edge Systems
07 8413	Penetration Firestopping
07 9200	Joint Sealants

**DIVISION 8 - OPENINGS**

08 1113	Hollow Metal Doors and Frames
08 1119	Stainless Steel Doors and Frames
08 3113	Access Doors and Frames
08 5200	Wood Windows
08 7100	Door Hardware
08 8000	Glazing
08 9119	Fixed Louvers

**DIVISION 9 – FINISHES**

09 2216	Non-Structural Metal Framing
09 2613	Gypsum Veneer Plastering

09 2900	Gypsum Board
09 3013	Ceramic Tiling
09 5113	Acoustical Panel Ceilings
09 5426	Wood Veneer Acoustic Ceiling Panels
09 6400	Wood Flooring, Treads and Risers
09 6519	Resilient Tile Flooring
09 6750	Urethane Cement Composition Flooring
09 9113	Exterior Painting
09 9123	Interior Painting
09 9300	Staining and Transparent Finishing

**DIVISION 10 - SPECIALTIES**

10 1423.16	Room-Identification Panel Signage
10 2113	Plastic Toilet Compartments
10 2800	Toilet Room Accessories

**DIVISION 12 – FURNISHINGS**

12 4816	Entrance Floor Grilles
---------	------------------------

**DIVISION 17 - OTHER**

17 1000	Removal/Disposal of PCB, Mercury-Containing, and Miscellaneous Materials
17 3000	Clearing of Roof Drains

**DIVISION 22 - PLUMBING**

22 0000	Common Work Requirements for Plumbing
22 1316	Sanitary & Waste Piping
22 1413	Facility Storm Drainage Piping & Specialties
22 4213.13	Commercial Water Closets
22 4213.16	Commercial Urinals
22 4216.13	Commercial Lavatories
22 4713	Drinking Fountains

**DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING**

23 0000	Common Work Requirements for HVAC
23 0593	Testing, Adjusting, Balancing for HVAC
23 0900	Control Systems Equipment

**DIVISION 26 - ELECTRICAL**

26 0100	Wiring Materials and Methods (Check w/ MUE to see if included)
26 0500	General Requirements (Basic Electrical Materials and Methods)
26 0519	Low-voltage Electrical Power Conductors and Cables
26 0523	Control Voltage Electrical Power Cables
26 0526	Grounding and Bonding for Electrical Systems
26 0529	Hangers and Supports for Electrical Systems
26 0533	Raceways and boxes for Electrical Systems

26 0544	Sleeves and Sleeve Seals for Electrical Raceways and Cabling
26 0553	Identification of Electrical Systems
26 0573	Overcurrent Protective Device Coordination Study
26 2200	LV Transformers
26 2416	Panelboards
26 2726	Wiring Devices
26 2813	Fuses
26 2816	Enclosed Switches and Circuit Breakers
26 4316	Transient-Voltage Suppression for Low-voltage Electrical Power Circuits
26 5119	LED Interior Lighting
26 5213	Emergency and Exit Lighting
26 5600	LED Exterior Lighting

END

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION 024119

### SELECTIVE DEMOLITION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Demolition and removal of selected site elements.
  - 2. Salvage of existing items to be reused or recycled.

##### 1.3 REFERENCE STANDARDS

- A. Comply with ANSI A10.6 and NFPA 241.

##### 1.4 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

##### 1.5 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

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

#### 1.6 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site, Disston Recreation Center, 4423 Longshore Ave, Philadelphia, PA, 19135 or other location as coordinated by Contractor.
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 5. Review areas where existing construction is to remain and requires protection.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Qualification Data: For demolition firm.
- C. Engineering Survey: Submit engineering survey of condition of building.
- D. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- E. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's and/or building manager's written consent to scheduled interruptions of on-site operations.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.
  - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- F. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.



- G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- H. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

#### 1.8 CLOSEOUT SUBMITTALS

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

#### 1.9 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- C. Pre-demolition Conference: Refer to paragraph 1.6.A above.

#### 1.10 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
  - 1. Before selective demolition, Owner will remove the following items:
    - a. Furniture from the offices and other building areas.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. All dimensions of existing elements shall be field verified by contractor prior to fabrications of materials and stairs.
- E. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
  - 1. Hazardous material remediation is specified elsewhere in the Contract Documents and section 02 8200 Removal of Asbestos Containing Materials..
  - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.
- F. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 3” or more.
  - G. Storage or sale of removed items or materials on-site is not permitted.
  - H. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
    1. Maintain fire-protection facilities in service during selective demolition operations.

#### 1.11 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:
  1. Of all the Existing furniture around the offices and building areas.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

#### 1.12 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations except as approved by written confirmation of schedule.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. Confirm during pre-construction meeting.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate, and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- E. **[Perform] [Engage a professional engineer to perform]** an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
  - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- F. **Verify that hazardous materials have been remediated before proceeding with building demolition operations.**
- G. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
  - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
  - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
  - 3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

### 3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimal impact to operations and minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

### 3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. Arrange to shut off utilities with utility companies.
  - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

### 3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain. Refer to Section 01500 "Temporary Facilities and Controls".
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

### 3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
  - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  - 5. Maintain fire watch during and for **at least two (2) hours** after flame-cutting operations.
  - 6. Maintain adequate ventilation when using cutting torches.
  - 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  - 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  - 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 10. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- B. Removed and Salvaged Items:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area designated by Owner.
  - 5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
  - 1. Clean and repair items to functional condition adequate for intended reuse.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." If solvent-based stripping methods are proposed, submit Health and Data Safety information, area work plan, and schedule for review and approval. Do not proceed with work without approval.
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Sections 075323 "EPDM Roofing" and 0776100 "Sheet Metal Roofing" and associated Sections for new roofing requirements.
1. Remove existing roof membrane, flashings, copings, and roof accessories.
  2. Remove existing roofing system down to substrate.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
1. Do not allow demolished materials to accumulate on-site.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
  4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

### 3.8 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

### 3.9 SELECTIVE DEMOLITION SCHEDULE

- A. Remove: **<Insert description of items and construction to remove>**.
  - 1. Fire Escape and concrete footing.
  - 2. Brick pier between doors.
  - 3. Gutter drains (Cornice).
  - 4. Bar Grating, Removable steel beam, angle below beam, existing angle and concrete as indicated on drawings.
- B. Remove and Salvage: **<Insert description of items to remove and salvage>**.
  - 1. Pipe Railings.
- C. Remove and Reinstall: **<Insert description of items to remove and reinstall>**.
- D. Existing to Remain: **<Insert description of items to remain>**.
  - 1. Perimeter Steel Beams.
- E. Dismantle: **<Insert description of items to be removed>**.

END OF SECTION 024119

SECTION 030130

MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Parge coating of existing cast in place concrete cheek walls.

1.2 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement parging mix.
2. Admixtures:
  - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

1.3 INFORMATIONAL SUBMITTALS

- A. Installer Qualifications: Submit a list of five projects that has been completed within the last five years, exhibiting the applicator's skills. The list shall include project name, location, and description of work and completion date.

1.4 QUALITY ASSURANCE

- A. Mockups: Prepare a test panel approximately 4-feet by 4-feet to demonstrate typical surface finish, texture, adhesion, and standard of workmanship.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all products in original labeled, sealed, and undamaged containers.
- B. Store all products in accordance with manufacturer's printed instructions.
- C. Handle products in accordance with manufacturer's printed instructions.

1.6 FIELD CONDITIONS

- A. All products shall be applied at substrate and ambient temperatures recommended by manufacturer.



SECTION 030130

MAINTENANCE OF CAST-IN-PLACE CONCRETE

- B. A minimum temperature of 40 degrees F shall be maintained 24 hours after completion of work.
- C. Protect products from weather and other damage for a period of 24 hours after installation. Do not apply products to frozen surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Sakcrete®, Parging Mix or comparable product by one of the following:
  - 1. Conproco.
  - 2. Sika.

2.2 SYSTEM DESCRIPTION

- A. The products shall meet or exceed the following performance requirements:

1. Physical state and appearance		Fine gray powder		
2. Base		Portland cement		
3. pH		>12		
4. Setting time by vicat needle	ASTM C191	Initial 60 minutes to final	285 minutes	
5. Percent air by volumetric	ASTM C173	6 percent		
		7 Days	14 Days	28 Days
6. Compressive strength – psi	ASTM C109	2900	3000	3400
7. Tensile strength – psi	ASTM C307	400	500	600

2.3 RELATED MATERIALS

- A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60, hot-dip galvanized-zinc coating.
  - 1. Diamond-Mesh Lath: Flat Self-furring, 2.5 lb/sq. yd..
- B. Concrete Repair Mortar: Trowel applied, single component, polymer modified cementitious repair mortar with anti-corrosion coating.
- C. Protective Covering: 8-feet- wide minimim plastic cover.

PART 3 - EXECUTION

3.1 EXAMINATION

## SECTION 030130

### MAINTENANCE OF CAST-IN-PLACE CONCRETE

- A. Installation shall be performed strictly in accordance with manufacturer's current product data bulletin.
- B. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.
- C. Coordinate installation with adjacent work to ensure proper sequence of construction.
- D. Protect adjacent areas and landscaping from contact due to mixing, handling, and application of materials.

#### 3.2 SURFACE PREPARATION

- A. Prior to application of products, inspect the substrate for proper cleaning and treatment of structural cracks, texture differences, damage, etc. Work shall not proceed until unsatisfactory conditions are corrected.
- B. Remove loose and deteriorated paint material, laitance, dirt, dust, oil and any surface contaminants that may inhibit proper bond.
- C. Repair spalled areas, static cracks and voids with concrete repair mortar mix per manufacturer's written instructions.
- D. Substrate must have open pored and textured surface (Concrete Surface Profile 3). For best results, grind or abrasive blast. Refer to ICRI Surface Preparation Guide 03732 for more details.

#### 3.3 INSTALLATION OF METAL LATH

- A. Metal Lath: Install according to ASTM C1063.
- B. Mechanically fasten galvanized diamond wire mesh to concrete surface.

#### 3.4 APPLICATION OF PARGE COAT

- A. Mechanically mix parge coat and any required admixtures per manufacturer's written instructions.
- B. Dampen exposed concrete.
- C. After mixing, apply initial layer of parging, by trowel, level with mesh surface.
- D. Rough-up surface with a coarse broom and allow to harden for 24 hours.
- E. Thoroughly saturate the area with clean water and apply a finishing layer to a damp surface not exceeding 10 mm (3/8 inch) in thickness.
- F. For finishing, use a wood, magnesium or aluminum float trowel for a smooth surface. For a textured surface, use a broom or brush.

SECTION 030130

MAINTENANCE OF CAST-IN-PLACE CONCRETE

3.5 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
  - 1. Allow newly placed material to set until surface is hard to the touch. Then keep material damp or cover with plastic to prevent evaporation of mix water for at least three (3) days. Protect from freezing for at least 24 hours.

3.6 PROTECTION

- A. Protect concrete surfaces as follows:
  - 1. Use protective methods and materials, including temporary covering, recommended in writing by manufacturer.

END OF SECTION 030130

## SECTION 033000

### CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Slabs
  - 2. Footings.

##### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 3 Section "03300 - Cast-in-Place Concrete" for general building applications of specially finished formed concrete.

##### 1.3 REFERENCE STANDARDS

- A. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 318, "Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)
  - 2. ACI 301, "Specification for Structural Concrete,"
  - 3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

##### 1.4 SUBMITTALS

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

- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement
  - D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
    - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
  - E. Welding certificates.
  - F. Qualification Data: For testing agency.
  - G. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
    - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
  - H. Material Certificates: For each of the following, signed by manufacturers:
    - 1. Cementitious materials.
    - 2. Admixtures.
    - 3. Form materials and form-release agents.
    - 4. Steel reinforcement and accessories.
    - 5. Curing compounds.
    - 6. Floor and slab treatments.
    - 7. Adhesives.
    - 8. Repair materials.
  - I. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.
  - J. Field quality-control test and inspection reports.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

#### 1.6 MOCK-UPS

- A. Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
- B. Erect Mock-Up at area as directed by Engineer. Mock-Up work can be incorporated into the final work.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).
- B. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

#### 1.8 FIELD CONDITIONS

- A. Provide adequate lighting on substrate surfaces.
- B. Restrict traffic from areas where concrete is poured.
- C. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1 and as follows.
  - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 2. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
  - 3. Do not use frozen materials or materials containing ice or snow.
  - 4. Do not place concrete in contact with surfaces less than 35 deg F (1.7 deg C), other than reinforcing steel.
  - 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- D. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:
  - 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F (35 deg C).

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## PART 2 - PRODUCTS

### 2.1 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  1. Portland Cement: ASTM C150/C150M, Type I, gray.
  2. Fly Ash: ASTM C618, Class C or F.
  3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
  4. Silica Fume: ASTM C1240 amorphous silica.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
  1. Maximum Coarse-Aggregate Size: 3/4-inch (19 mm) nominal.
  2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M.

### 2.2 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

1. Products:

- a. Boral Material Technologies, Inc.; Boral BCN.
- b. Euclid Chemical Company (The); Eucon CIA.
- c. Grace Construction Products, W. R. Grace & Co.; DCI.
- d. Master Builders, Inc.; Rheocrete CNI.
- e. Sika Corporation; Sika CNI.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Products:

- a. Axim Concrete Technologies; Catexol 1000CI.
- b. Boral Material Technologies, Inc.; Boral BCN2.
- c. Cortec Corporation; MCI [2000] [2005NS].
- d. Grace Construction Products, W. R. Grace & Co.; DCI-S.
- e. Master Builders, Inc.; Rheocrete 222+.
- f. Sika Corporation; FerroGard-901.

E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments, or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

1. Manufacturers:

- a. Bayer Corporation.
- b. ChemMasters.
- c. Conspec Marketing & Manufacturing Co., Inc.; a Dayton Superior Company.
- d. Davis Colors.
- e. Elementis Pigments, Inc.
- f. Hoover Color Corporation.
- g. Lambert Corporation.
- h. Scofield, L. M. Company.
- i. Solomon Colors.

## 2.3 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing 3/8-inch (9.5-mm) sieve.

1. Products:

- a. Anti-Hydro International, Inc.; Emery.
- b. Dayton Superior Corporation; Emery Non-Slip.



- c. Emeri-Crete, Inc.; Emeri-Topcrete.
  - d. Lambert Corporation; EMAG-20.
  - e. L&M Construction Chemicals, Inc.; Grip It.
  - f. Metalcrete Industries; Metco Anti-Skid Aggregate.
- B. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of Portland cement, graded quartz aggregate, and plasticizing admixture.
- 1. Products:
    - a. Burke by Edoco; NonMetallic Floor Hardener.
    - b. ChemMasters; Concolor.
    - c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Conshake 500.
    - d. Dayton Superior Corporation; Quartz Tuff.
    - e. Euclid Chemical Company (The); Surfex.
    - f. Kaufman Products, Inc.; Tycron.
    - g. Lambert Corporation; Colorhard.
    - h. L&M Construction Chemicals, Inc.; Quartzplate FF.
    - i. MBT Protection and Repair, Div. of ChemRex; Maximent.
    - j. Metalcrete Industries; Floor Quartz.
    - k. Scofield, L. M. Company; Lithochrome Color Hardener.
    - l. Symons Corporation, a Dayton Superior Company; Hard Top.
    - m. Vexcon Chemicals, Inc.; Durag Premium.

## 2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- 1. Products:
    - a. Axim Concrete Technologies; Cimfilm.
    - b. Burke by Edoco; BurkeFilm.
    - c. ChemMasters; Spray-Film.
    - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
    - e. Dayton Superior Corporation; Sure Film.
    - f. Euclid Chemical Company (The); Eucobar.
    - g. Kaufman Products, Inc.; Vapor Aid.
    - h. Lambert Corporation; Lambco Skin.
    - i. L&M Construction Chemicals, Inc.; E-Con.
    - j. MBT Protection and Repair, Div. of ChemRex; Confilm.
    - k. Meadows, W. R., Inc.; Sealtight Evapre.
    - l. Metalcrete Industries; Waterhold.
    - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
    - n. Sika Corporation, Inc.; SikaFilm.

- o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
  - p. Unitex; Pro-Film.
  - q. US Mix Products Company; US Spec Monofilm ER.
  - r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products:
- a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
  - b. Burke by Edoco; Aqua Resin Cure.
  - c. ChemMasters; Safe-Cure Clear.
  - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
  - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
  - f. Euclid Chemical Company (The); Kurez DR VOX.
  - g. Kaufman Products, Inc.; Thinfilm 420.
  - h. Lambert Corporation; Aqua Kure-Clear.
  - i. L&M Construction Chemicals, Inc.; L&M Cure R.
  - j. Meadows, W. R., Inc.; 1100 Clear.
  - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
  - l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
  - m. Tamms Industries, Inc.; Horncure WB 30.
  - n. Unitex; Hydro Cure 309.
  - o. US Mix Products Company; US Spec Maxcure Resin Clear.
  - p. Vexcon Chemicals, Inc.; Certi-Vex EnvioCure 100.

## 2.5 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars, [ASTM A 775/A 775M] epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.

## 2.6 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.

- B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, ASTM A 775/A 775M epoxy coated.
- C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.
- D. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar support contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
  - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

## 2.7 RELATED MATERIALS

- A. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.8 REPAIR MATERIALS

- A. Approved product: Provide product as listed on design drawings (Sikacrete-421 CI Rapid) or approved equal. Reference manufacturer specifications.
- B. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

- C. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
  4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

## 2.9 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.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.][ Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
  2. Combined Fly Ash and Pozzolan: 25 percent.
  3. Ground Granulated Blast-Furnace Slag: 50 percent.
  4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
  5. Silica Fume: 10 percent.
  6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
  7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture in concrete, as required, for placement and workability.
  2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
  4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

## 2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116 and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
  3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions:
1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
  2. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

### 3.3 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
  2. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  1. Install keyways, reglets, recesses, and the like, for easy removal.
  2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.4 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
  - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
  - 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

### 3.5 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.6 SHORES AND RESHORES (NOT USED)

### 3.7 VAPOR RETARDERS (NOT USED)

### 3.8 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
  1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

### 3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
  1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time



necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
  
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
  
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.10 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 (6 mm) in 1 direction.
  - 1. Apply scratch finish to surfaces indicated

- 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
- 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
  2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb./100 sq. ft. (12 kg/10 sq. m)] < of dampened slip-resistive aggregate over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
  2. After broadcasting and tamping, apply float finish.
  3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.
- G. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:
1. Uniformly apply dry-shake floor hardener at a rate of 100 lb./100 sq. ft. (49 kg/10 sq. m) unless greater amount is recommended by manufacturer.
  2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
  3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

### 3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

### 3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. 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 (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

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

### 3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  1. Defer joint filling until concrete has aged at least [one] [six] month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one-part Portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar

- before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, pop outs, honeycombs, rock pockets, crazing and cracks more than 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
  - 1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
  - 2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
  - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    - a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
      - 1) Project name.
      - 2) Name of testing agency.
      - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
      - 4) Name of concrete manufacturer.
      - 5) Date and time of inspection, sampling, and field testing.
      - 6) Date and time of concrete placement.
      - 7) Location in Work of concrete represented by samples.
      - 8) Date and time sample was obtained.
      - 9) Truck and batch ticket numbers.
      - 10) Design compressive strength at 28 days.
      - 11) Concrete mixture designation, proportions, and materials.
      - 12) Field test results.
      - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
      - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
  - 1. Verification of use of required design mixture.
  - 2. Concrete placement, including conveying and depositing.
  - 3. Curing procedures and maintenance of curing temperature.
  - 4. Verification of concrete strength before removal of shores and forms from beams and slabs.
  - 5. Batch Plant Inspections: On a random basis, as determined by Architect.

- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
    - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C143/C143M:
    - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    - b. Perform additional tests when concrete consistency appears to change.
  3. Slump Flow: ASTM C1611/C1611M:
    - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    - b. Perform additional tests when concrete consistency appears to change.
  4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.
    - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  5. Concrete Temperature: ASTM C1064/C1064M:
    - a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
  6. Compression Test Specimens: ASTM C31/C31M:
    - a. Cast and laboratory cure two sets of 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) cylinder specimens for each composite sample.
    - b. Cast, initial cure, and field cure two sets of four standard cylinder specimens for each composite sample.
  7. Compressive-Strength Tests: ASTM C39/C39M.
    - a. Test one set of four laboratory-cured specimens at seven days and one set of two specimens at 28 days.
    - b. Test one set of four field-cured specimens at seven days and one set of two specimens at 28 days.
    - c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
  9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).
  10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
  11. Additional Tests:
    - a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
      - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 (ACI 301M), section 1.6.6.3.
  12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 (ASTM E1155M) within 48 hours of completion of floor finishing and promptly report test results to Architect.

### 3.16 PROTECTION

- A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
  2. Diaper hydraulic equipment used over concrete surfaces.
  3. Prohibit vehicles from interior concrete slabs.
  4. Prohibit use of pipe-cutting machinery over concrete surfaces.
  5. Prohibit placement of steel items on concrete surfaces.
  6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION

PROJECT No. 16228E-03-01  
033000-1  
CAST-IN-PLACE CONCRETE



## SECTION 034900

### GLASS-FIBER-REINFORCED CONCRETE (GFRC)

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Glass-fiber-reinforced concrete (GFRC) panels with panel frames. GFRC applications include the following:
  - a. Cornice units with integral gutter and dentils.
  - b. Fascia units.
  - c. Pent units.

###### B. Related Requirements:

1. Section 075556 "Cold Liquid-applied Reinforced Protected Membrane Waterproofing" for liquid-applied reinforced flashings at the integral gutters.
2. Section 076200 "Sheet Metal Flashing" for flashing between cornice and roof/ masonry.
3. Section 079200 "Joint Sealants" for backer rod and sealants

##### 1.2 DEFINITIONS

- A. Design Reference Sample: Sample of GFRC color, finish, and texture, preapproved by Architect.
- B. GFRC Panels: GFRC components, including panel frames, anchors, connections, and integral ribs, as applicable.

##### 1.3 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

##### 1.4 PREINSTALLATION MEETINGS

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

##### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
  1. Fasteners.
  2. Welding electrodes.

SECTION 034900

GLASS-FIBER-REINFORCED CONCRETE (GFRC)

3. Cold-formed steel framing.
4. Steel channel and angle framing.
5. GFRC design mixes.

B. Shop Drawings: Show fabrication and installation details for GFRC panels including the following:

1. Panel elevations, sections, and dimensions.
2. Thickness of facing mix, GFRC backing, and bonding pads for typical panels.
3. Finishes.
4. Joint and connection details.
5. Panel corner details.
6. Erection details.
7. Panel frame details for typical panels including sizes, spacings, thicknesses, and yield strengths of various members.
8. Locations and details of connection hardware attached to structure.
9. Sizes, locations, and details of flex, gravity, and seismic anchors for typical panels.
10. Erection sequence for special conditions.
11. Relationship to adjacent materials.
12. Description of loose, cast-in, and field hardware.

C. Samples for Verification: Actual sample of finished products representative of GFRC finish, color, and texture variations.

1. Size: Full panel size for cornice, pent and fascia.

D. Delegated Design Submittals: For GFRC panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Welding certificates.
2. Steel Sheet Certificates: For steel sheet used in cold-formed steel panel framing, mill certificates signed by manufacturers of steel sheet, or test reports from a qualified testing agency, indicating that steel sheet used in cold-formed metal panel framing complies with requirements including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.
3. Mill Certificates: For structural-steel shapes and hollow structural sections used in panel framing.

A. Qualification Statements: For GFRC manufacturer and installer. Installer shall submit a list of five projects exhibiting the installer's skills working with GFRC. The list shall include project name, location, and description of work and completion date.

B. Delegated Design Engineer Qualifications: Include the following:

PROJ. NO. 16228E-03-01  
034900-2

GLASS-FIBER-REINFORCED CONCRETE (GFRC)

## SECTION 034900

### GLASS-FIBER-REINFORCED CONCRETE (GFRC)

1. Experience providing delegated design engineering services of the type indicated.
2. Documentation that delegated design engineer is licensed in state where Project is located.

#### 1.7 QUALITY ASSURANCE

##### A. Qualifications:

1. Manufacturers: Designated a PCI-certified plant for Group G - Glass Fiber Reinforced Concrete, and who employs on Project experienced PCI-certified GFRC testing and inspection personnel, or designated an IAS AC157-certified plant for GFRC, or designated an APA-certified plant for GFRC production.
2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.
3. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
  - a. AWS D1.1/D1.1M.
  - b. AWS D1.3/D1.3M.

#### 1.8 MOCKUPS

##### A. Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of one complete cornice panel, pent panel and fascia panel.
  - a. Include typical components, attachments to building structure, and methods of installation.
  - b. Include integral gutter and dentil.
  - c. Include typical flashing components.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Handle and transport GFRC panels supported on nonstaining material and with nonstaining resilient spacers between panels.
- B. Store GFRC panels off of ground on firm, level, and smooth surfaces supported on nonstaining material and with nonstaining resilient spacers between panels. Place stored panels so identification marks are clearly visible.

SECTION 034900

GLASS-FIBER-REINFORCED CONCRETE (GFRC)

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of GFRC panels that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures, including cracking.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. GFRC Panels:
  - 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. Advanced Architectural Stone.
    - b. GFRC Cladding Systems, LLC.
    - c. Stromberg Architectural Products, Inc.
    - d. CGA Stoneworks.

2.2 SOURCE LIMITATIONS

- A. Obtain GFRC panels from single manufacturer.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design GFRC panels.
- B. Structural Performance: GFRC panels to withstand the following design loads as well as the effects of thermal- and moisture-induced dimensional changes within limits and under conditions indicated:
  - 1. Loads: As indicated on Drawings.
  - 2. Dead Loads: As indicated on Drawings.
  - 3. Live Loads: As indicated on Drawings.
  - 4. Wind Loads: As indicated on Drawings.
  - 5. Seismic Loads: As indicated on Drawings.

## SECTION 034900

### GLASS-FIBER-REINFORCED CONCRETE (GFRC)

6. Deflection Limits: Design panel frames to withstand design loads without lateral deflections greater than L/240 of wall span.
  7. Thermal Movements: Provide for thermal movements resulting from annual ambient temperature changes of 80 deg F (26 deg C).
  8. Design panel frames and connections to accommodate deflections and other building movements.
- C. Quality-Control Standard: Comply with requirements and recommendations in PCI MNL 130, "Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products," unless more stringent requirements are indicated.
- D. AISI Specifications: Comply with AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members."
- E. AISC Specifications: Comply with AISC 360, "Specification for Structural Steel Buildings."

#### 2.4 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous GFRC surfaces within tolerances; nonreactive with GFRC and capable of producing required finish surfaces.
1. Mold-Release Agent: Commercially produced liquid-release agent that does not bond with, stain, or adversely affect GFRC surfaces and does not impair subsequent surface or joint treatments of GFRC.
- B. Surface Retarder: Chemical liquid-set retarder capable of temporarily delaying hardening of newly placed GFRC face mix to depth of reveal specified.

#### 2.5 GFRC MATERIALS

- A. Obtain each GFRC material of same type, brand, and color from single source or producer.
- B. Portland Cement: ASTM C150/C150M; Type I, or III.
1. For surfaces exposed to view in finished structure, use white cement.
- C. Glass Fibers: Alkali resistant, with a minimum zirconia content of 16 percent, 1 to 2 inches (25 to 50 mm) long, specifically produced for use in GFRC, and complying with ASTM C1666/C1666M.
- D. Backing Sand: Washed and dried silica, complying with composition requirements in ASTM C144; passing a No. 20 (0.85-mm) sieve with a maximum of 2 percent passing a No. 100 (0.15-mm) sieve.
- E. Facing Aggregate: ASTM C33/C33M, except for gradation, and PCI MNL 130, 1/4-inch (6-mm) maximum size.

## SECTION 034900

### GLASS-FIBER-REINFORCED CONCRETE (GFRC)

1. Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match sample.
  2. Fine Aggregate: Natural or manufactured sand with a maximum of 5 percent passing a **No. 100 (0.15-mm)** sieve and a maximum of 3 percent passing a **No. 200 (0.075-mm)** sieve.
- F. Coloring Admixture: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.
- G. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of GFRC and complying with ASTM C1602/C1602M and chemical limits in PCI MNL 130 for nonpotable mixing water.
- H. Polymer-Curing Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130.
- I. Chemical Admixtures: ASTM C494/C494M, containing not more than 0.1 percent chloride ions.

### 2.6 ANCHORS, CONNECTORS, AND MISCELLANEOUS MATERIALS

- A. Stainless Steel Plates: ASTM A666, Type 304, Type 316, or Type 201.
- B. Carbon-Steel Shapes and Plates: ASTM A36/A36M, finished as follows:
1. Finish: Zinc coated by hot-dip process in accordance with ASTM A123/A123M, after fabrication, or ASTM A153/A153M, as applicable.
- C. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.
- D. Malleable-Iron Castings: ASTM A47/A47M, **Grade 32510 (Grade 22010)**.
- E. Carbon-Steel Castings: ASTM A27/A27M, **Grade 60-30 (Grade 415-205)**.
- F. Carbon-Steel Bolts: ASTM A307, Grade A; carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers, finished as follows:
1. Finish: Zinc coated by hot-dip process in accordance with ASTM A123/A123M, after fabrication, and ASTM A153/A153M, as applicable.
- G. Welding Electrodes: Comply with AWS standards.
- H. Galvanizing Repair Paint: ASTM A 780/A 780M.

## SECTION 034900

### GLASS-FIBER-REINFORCED CONCRETE (GFRC)

#### 2.7 PANEL FRAME MATERIALS

- A. Cold-Formed Steel Framing: Manufacturer's standard C-shaped steel studs, complying with AISI S100 with minimum uncoated steel thickness of **0.053 inch (1.35 mm)**; with stiffened flanges, U-shaped steel track; and of the following steel sheet:
  - 1. Metallic-Coated Steel Sheet: ASTM A653/A653M, structural-steel sheet, **G90 (Z275)** zinc coating, of grade required by structural performance of framing.
- B. Steel Channel and Angle Framing: ASTM A36/A36M, finished as follows:
  - 1. Finish: Shop primed with organic zinc-rich primer complying with SSPC-Paint 20 on surfaces prepared to comply with SSPC-SP 6/NACE No. 3.

#### 2.8 GFRC MIXES

- A. Face Mix: Proportion face mix of portland cement, facing aggregates, water, and admixtures to comply with design requirements.
- B. Backing Mix: Proportion backing mix of portland cement, glass fibers, sand, water, and admixtures to comply with design requirements. Provide nominal glass-fiber content of not less than 5 percent by weight of total mix.
- C. Polymer-Curing Admixture: 6 to 7 percent by weight of polymer-curing admixture solids to dry portland cement.
- D. Coloring Admixture: Not to exceed 10 percent of cement weight.

#### 2.9 PANEL FRAME FABRICATION

- A. Fabricate panel frames and accessories plumb, square, true to line, and with components securely fastened.
  - 1. Fabricate panel frames using jigs or templates.
  - 2. Cut cold-formed metal framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed metal framing members by welding. Comply with AWS D1.3/D1.3M.
  - 4. Fasten framing members of steel channels, or steel angles by welding. Comply with AWS D1.1/D1.1M.
  - 5. Weld anchors to panel frames.
- B. Reinforce framing assemblies, as necessary, to withstand erection stresses.
- C. Galvanizing Repair: Touch up damaged galvanized surfaces in accordance with ASTM A780/A780M.

SECTION 034900

GLASS-FIBER-REINFORCED CONCRETE (GFRC)

2.10 MOLD FABRICATION

- A. Construct molds that result in finished GFRC complying with profiles, dimensions, and tolerances indicated, without damaging GFRC during stripping. Construct molds to prevent water leakage and loss of cement paste.
  - 1. Coat contact surfaces of molds with form-release agent.
  - 2. Coat contact surfaces of molds with surface retarder.

2.11 GFRC FABRICATION

- A. Proportioning and Mixing: For backing mix, meter sand/cement slurry and glass fibers to spray head at rates to achieve design mix proportions and glass-fiber content in accordance with PCI MNL 130 procedures.
- B. Spray Application: Comply with spray-up method procedures in accordance with PCI MNL 130.
- C. Hand form and consolidate intricate details, incorporate formers or infill materials, and overspray before material reaches initial set to ensure complete bonding.
- D. Attach panel frame to GFRC before initial set of GFRC backing, maintaining a minimum clearance of **1/2 inch (13 mm)** from GFRC backing, and without anchors protruding into GFRC backing.
- E. Build up homogeneous GFRC bonding pads over anchor feet, maintaining a minimum thickness of **1/2 inch (13 mm)** over tops of anchor feet, before initial set of GFRC backing. Measure bonding pad thickness at 25 percent of anchor locations.
- F. Inserts and Embedments: Build up homogeneous GFRC bosses or bonding pads over inserts and embedments to provide enough anchorage and embedment to comply with design requirements.
- G. Curing: Employ initial curing method that ensures sufficient strength for removing units from mold. Comply with PCI MNL 130 procedures.
  - 1. Keep moisture off the surfaces of mixes with polymer curing admixtures during the first three hours of curing. Maintain temperature between **60 and 120 deg F (16 and 49 deg C)** during the first 16 hours.
  - 2. Prevent drying of moist curing mixes during the first 24 hours. Maintain units in surface-damp condition at a temperature above **60 deg F (16 deg C)** and 95 percent relative humidity for seven days.
- H. Panel Identification: Mark each GFRC panel to correspond with identification mark on Shop Drawings. Mark each panel with its casting date.



SECTION 034900

GLASS-FIBER-REINFORCED CONCRETE (GFRC)

2.12 FABRICATION TOLERANCES

- A. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with PCI MNL 130 dimensional tolerances.
1. Overall Height and Width of Units, Measured at the Face Adjacent to Mold:
    - a. 10 ft. (3 m) or less, plus or minus 1/8 inch (3 mm).
    - b. More than 10 ft. (3 m), plus or minus 1/8 inch per 10 ft. (3 mm per 3 m); 1/4 inch (6 mm) maximum.
  2. Edge Return: Plus 1/2 inch (13 mm), minus 0 inch (0 mm).
  3. Architectural Facing Thickness: Plus 1/8 inch (3 mm), minus 0 inch (0 mm).
  4. Backing Thickness: Plus 1/4 inch (6 mm), minus 0 inch (0 mm).
  5. Panel Depth from Face of Skin to Back of Panel Frame or Integral Rib: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
  6. Angular Variation of Plane of Side Mold: Plus or minus 1/32 inch per 3 inches (0.8 mm per 75 mm) of depth, or plus or minus 1/16 inch (1.5 mm) total, whichever is greater.
  7. Variation from Square or Designated Skew (Difference in Length of Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches (3 mm per 1800 mm) or 1/4 inch (6 mm) total, whichever is greater.
  8. Local Smoothness: 1/4 inch per 10 ft. (6 mm per 3 m).
  9. Bowing: Not to exceed L/240 unless panel complies with erection tolerances using connection adjustments.
  10. Length and Width of Block Outs and Openings within One Panel: Plus or minus 1/4 inch (6 mm).
  11. Location of Window Opening within Panel: Plus or minus 1/4 inch (6 mm).
  12. Maximum Permissible Warpage of One Corner out of the Plane of the Other Three: 1/16 inch per 12 inches (1.5 mm per 305 mm) of distance from nearest adjacent corner, unless panel complies with erection tolerances using connection adjustments.
- B. Position Tolerances: Measured from datum line locations, as indicated on Shop Drawings.
1. Panel Frame and Track: Plus or minus 1/4 inch (6 mm).
  2. Inserts: Plus or minus 1/2 inch (13 mm).
  3. Special Handling Devices: Plus or minus 3 inches (75 mm).
  4. Location of Bearing Devices: Plus or minus 1/4 inch (6 mm).
  5. Block Outs: Plus or minus 3/8 inch (10 mm).
- C. Panel Frame Tolerances: As follows:
1. Vertical and Horizontal Alignment: 1/4 inch per 10 ft. (6 mm per 3 m).
  2. Spacing of Framing Member: Plus or minus 3/8 inch (10 mm).
  3. Squareness of Frame: Difference in length of diagonals of 3/8 inch (10 mm).
  4. Overall Size of Frame: Plus or minus 3/8 inch (10 mm).

SECTION 034900

GLASS-FIBER-REINFORCED CONCRETE (GFRC)

2.13 FINISHES

- A. Exposed faces to be free of joint marks, grain, and other obvious defects. Corners, including false joints, to be uniform, straight, and sharp.
- B. Finish exposed-face surfaces of GFRC to match approved design reference sample panels and as follows:
  - 1. Design Reference Sample: Advanced Architectural Stone, Classic White.

2.14 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate GFRC fabricator's quality-control and testing methods.
  - 1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and GFRC mixes as may be requested for additional testing and evaluation.
- B. Quality-Control Testing: Establish and maintain a quality-control program for manufacturing GFRC panels in accordance with PCI MNL 130.
  - 1. Test materials and inspect production techniques.
  - 2. Quality-control program monitors glass-fiber content, spray rate, unit weight, product physical properties, anchor pull-off and shear strength, and curing period and conditions.
  - 3. Prepare test specimens and test in accordance with ASTM C1228 and PCI MNL 130 procedures.
  - 4. Test GFRC inserts and anchors in accordance with ASTM C1230 to validate design values.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine structure and conditions for compliance with requirements for installation tolerances, bearing surfaces, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Install clips, hangers, and other accessories required for connecting GFRC panels to supporting members and backup materials.

## SECTION 034900

### GLASS-FIBER-REINFORCED CONCRETE (GFRC)

- B. Install GFRC panels level, plumb, square, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.
  - 1. Maintain horizontal and vertical joint alignment and uniform joint width.
  - 2. Remove projecting hoisting devices.
- C. Connect GFRC panels in position by bolting or welding, or both, as indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as possible after connecting is completed.
- D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.3/D1.3M requirements for welding, appearance, quality of welds, and methods used in correcting welding work.
  - 1. Protect GFRC panels from damage by field welding or cutting operations, and provide noncombustible shields as required.
- E. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

### 3.3 ERECTION TOLERANCES

- A. Erect GFRC panels to comply with the following noncumulative tolerances. For erection tolerances not listed below, comply with PCI MNL 130.
  - 1. Plan Location from Building Grid Datum: Plus or minus **1/2 inch (13 mm)**.
  - 2. Top Elevation from Nominal Top Elevation:
    - a. Exposed Individual Panel: Plus or minus **1/4 inch (6 mm)**.
    - b. Nonexposed Individual Panel: Plus or minus **1/2 inch (13 mm)**.
    - c. Exposed Panel Relative to Adjacent Panel: **1/4 inch (6 mm)**.
    - d. Nonexposed Panel Relative to Adjacent Panel: **1/2 inch (13 mm)**.
  - 3. Support Elevation from Nominal Elevation:
    - a. Maximum Low: **1/2 inch (13 mm)**.
    - b. Maximum High: **1/4 inch (6 mm)**.
  - 4. Maximum Plumb Variation over the Lesser of Height of Structure or **100 Ft. (30 m)**: **1 inch (25 mm)**.
  - 5. Plumb in Any **10 Ft. (3 m)** of Element Height: **1/4 inch (6 mm)**.
  - 6. Maximum Offset in Alignment of Matching Edges: **1/4 inch (6 mm)**.
  - 7. Face Width of Joint (Governs over Joint Taper):
    - a. Panel Dimension **20 Ft. (6 m)** or Less: Plus or minus **1/4 inch (6 mm)**.
    - b. Panel Dimension More Than **20 Ft. (6 m)**: Plus or minus **3/8 inch (9.5 mm)**.
  - 8. Maximum Joint Taper: **3/8 inch (10 mm)**.
  - 9. Maximum Joint Taper in **10 Ft. (3 m)**: **1/4 inch (6 mm)**.
  - 10. Maximum Offset in Alignment of Matching Faces: **1/4 inch (6 mm)**.

SECTION 034900

GLASS-FIBER-REINFORCED CONCRETE (GFRC)

11. Differential Bowing, as Erected, between Adjacent Members of Same Design: 1/4 inch (6 mm).

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections and prepare reports:
  1. Erection of GFRC panels.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- C. Visually inspect field welds and test in accordance with ASTM E165/E165M or with ASTM E709 and ASTM E1444/E1444M. High-strength bolted connections are subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, to be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS

- A. Repairs are permitted provided structural adequacy of GFRC panel and appearance are not impaired, as approved by Architect.
- B. Mix patching materials and repair GFRC so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces.
- C. Remove and replace damaged GFRC panels when repairs do not comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Perform cleaning procedures, if necessary, in accordance with GFRC manufacturer's written instructions. Clean soiled GFRC surfaces with detergent and water, using soft fiber brushes and sponges, and rinse with clean water. Prevent damage to GFRC surfaces and staining of adjacent materials.

END OF SECTION 034900

SECTION 040120

MASONRY REPAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings 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 maintenance of unit masonry consisting of brick, clay masonry restoration. as follows:
  - 1. Installing flashing.
  - 2. Unused anchor removal.
  - 3. Repairing unit masonry, including replacing units.
  - 4. Painting steel uncovered during the work.
  - 5. Repointing joints.
  - 6. Cleaning replaced and repointed unit masonry surfaces.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- B. Samples for Initial Selection: For the following:
  - 1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6-inches long by 3/8 inch wide, set in aluminum or plastic channels.
    - a. Submit a set of at least three samples of different mixes of colored sands and cements that produce a mortar matching the existing mortar when cured and dry.
    - b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
  - 2. Sealant Materials: See Section 079200 "Joint Sealants."
- C. Samples for Verification: For the following:
  - 1. Each type of masonry unit to be used for replacing existing units. Include sets of Samples as necessary to show the full range of shape, color, and texture to be expected.
    - a. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.

SECTION 040120

MASONRY REPAIRS

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For mason

1.5 QUALITY ASSURANCE

- A. Mason: Engage an experienced masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience installing standard unit masonry is not sufficient.
- B. Mockups: Prepare mockups of masonry to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
  - 1. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. Size mockup not smaller than 36-inches by 24-inches. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work.
    - a. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.
- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements and when there is no risk of water entering the building.
- B. Repair masonry units and repoint mortar joints only when air temperature is above 35 degrees and it is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.

## SECTION 040120

### MASONRY REPAIRS

- C. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
  - 1. When air temperature is below 40 deg F heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F
  - 2. When mean daily air temperature is below 40 deg F provide blankets to cover masonry for 7 days after repair and pointing.
- D. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.
- E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.
- F. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

## 1.8 COORDINATION

- A. Coordinate masonry work and cleaning with owners use at Project site. Plan and execute the Work accordingly.

## PART 2 - PRODUCTS

### 2.1 MASONRY MATERIALS

- A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry work.
  - 1. Provide units with colors, color variation within units, surface texture, size, and shape to match existing brickwork and with physical properties
    - a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.
- B. Building Brick: Provide building brick complying with ASTM C 62, of same vertical dimension as face brick, for masonry work concealed from view.
  - 1. Grade SW, MW, or NW for concealed backup.
- C. Salvaged Brick: Salvage brick during demolition. Clean off residual mortar.

SECTION 040120

MASONRY REPAIRS

2.2 MORTAR MATERIALS

- A. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- B. Masonry Cement: ASTM C 91.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Lafarge North America Inc.
    - b. Lehigh Cement Company
    - c. National Cement Company, Inc.
- C. Colored Cement Product: Packaged blend made from portland cement and hydrated lime masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
  - 1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Colored Portland Cement-Lime Mix:
      - 1) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
      - 2) Lafarge North America Inc.; Eaglebond Portland & Lime.
      - 3) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
    - b. Colored Masonry Cement:
      - 1) Lafarge North America Inc.; U.S. Cement Custom Color Masonry Cement.
      - 2) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
      - 3) National Cement Company, Inc.; Coosa Masonry Cement.
  - 2. Formulate blend as required to produce color matching existing mortar.
- D. Aggregate for Mortar: ASTM C 144.
  - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  - 2. White-Mortar Aggregates: Natural white sand or crushed white stone.
  - 3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

2.3 ACCESSORY MATERIALS

- A. Ties and Anchors: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
  - 1. Hohmann & Barnard HB-5213-2X



SECTION 040120

MASONRY REPAIRS

- a. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
  2. Hohmann & Barnard Spira-Lok
    - a. Stainless Steel Type 304, One-Piece flexible wall tie for repair and restoration of deteriorating brick masonry. Diameter and length as required for existing wall construction.
  3. Thor Helical Crack Stitching Bars
    - a. Stainless Steel Type 304, 1/4" diam x 39" long, for crack repair of masonry walls. Use with WHO-60 grout, polymer modified cement-based mortar for bonding metal bars and anchors into masonry joints.
  4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
  5. Expansion Bolt, 304 Stainless with a Brass 260 Alloy Sleeve.
- B. Embedded Flashing:
1. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual and as follows:
    - a. Stainless Steel: ASTM A 240/A 240M, Type 304, 24 gauge.
  2. Flexible Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymers alloy.
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Hohmann & Barnard, Inc.; Flex-Flash.
  3. Application: Unless otherwise indicated, use the following:
    - a. Where flashing cannot be fully supported use metal flashing.
    - b. Where flashing is fully supported use flexible flashing.
  4. Solder and Sealants for Sheet Metal Flashings
    - a. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
  5. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- C. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- D. Weep/Vent Products:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

PROJ. NO. 16228E-03-01

040120-5

MASONRY REPAIRS

SECTION 040120

MASONRY REPAIRS

2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
- E. Masonry Cleaners:
1. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ProSoCo, Inc.
- F. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #79, Alkyd Anticorrosive Metal Primer or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating
1. Use coating requiring no better than SSPC-SP 3, "Power Tool Cleaning" surface preparation according to manufacturer's literature or certified statement.

PART 3 - EXECUTION

3.1 UNUSED ANCHOR REMOVAL

- A. Within the work areas, remove masonry anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.
1. Remove items carefully to avoid spalling or cracking masonry.

3.2 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
1. Remove brick to replace brick flashing at areas indicated on the drawings.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

## SECTION 040120

### MASONRY REPAIRS

1. To install continuous flashing in existing walls, alternate sections of masonry in 2 to 5 feet.
  2. The replaced masonry should be properly cured (five to seven days) before the intermediate masonry sections or supports are removed.
  3. Alternately, temporary braces can be installed if longer sections of brickwork are removed.
    - a. Braces to be spaced no further than 5 feet apart.
- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition as many whole bricks as possible.
1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
  2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
  3. Store brick for reuse. Store off ground, on skids, and protected from weather.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Replace removed damaged brick with a blend of new and salvaged brick in good quality, where possible, or with new brick matching existing brick, including size.
- G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
1. Maintain joint width for replacement units to match existing joints.
  2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min.. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
  2. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.
  3. Point head of top course with ¾" depth lifts and a pointing trough.

### 3.3

#### PAINTING STEEL UNCOVERED DURING THE WORK

- A. Inspect steel exposed during masonry removal. Prepare and paint steel as follows:

PROJ. NO. 16228E-03-01

040120-7

MASONRY REPAIRS

## SECTION 040120

### MASONRY REPAIRS

1. Remove paint, rust, and other contaminants according to SSPC-SP 3, "Power Tool Cleaning, as applicable to meet paint manufacturer's recommended preparation.
  2. Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).
- B. If on inspection and rust removal, the cross section of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

#### 3.4 WIDENING JOINTS

- A. Do not widen a joint, except where indicated or approved by Architect.
- B. Location Guideline: Where an existing masonry unit abuts another or the joint is less than 1/8 inch widen the joint for length indicated and to depth required for repointing after obtaining Architect's approval.
- C. Carefully perform widening by cutting, grinding, routing, or filing procedures demonstrated in an approved mockup.
- D. Widen joint to width equal to or less than predominant width of other joints on building. Make sides of widened joint uniform and parallel. Ensure that edges of units along widened joint are in alignment with joint edges at unaltered joints.

#### 3.5 MASONRY INSTALLATION, GENERAL

- A. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- B. Blend at least 20 percent of the existing brick into the new brick.
  1. At locations visible to the public replace with salvaged brick only.
- C. Mix units from several pallets or cubes as they are placed.
- D. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

#### 3.6 TOLERANCES

- A. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
- B. Joints:

## SECTION 040120

### MASONRY REPAIRS

1. For bed joints, do not vary from thickness by more than 1/16 inch from one masonry unit to the next.

#### 3.7 MORTAR BEDDING AND JOINTING

##### A. Hollow block as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings.

##### B. Solid masonry and glass units:

1. Completely fill bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
2. Point top head joint using ¾" lifts and packing with a pointing trowel.
3. Tool exposed joints to match existing mortar when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

#### 3.8 EXPANSION JOINTS

##### A. General: Install expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.

##### B. Form expansion joints in brick as follows:

1. Form open joint full depth of brick wythe and of 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

##### C. Provide horizontal, pressure-relieving joints by inserting a compressible filler of 3/8-inch width.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

#### 3.9 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

##### A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated

##### B. Install stainless steel through wall flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections. Seal penetrations in flashing with adhesive, sealant, or tape.
2. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of backup at least 8 inches; with upper edge secured with a termination bar at 12" oc.. Apply sealant to top of termination bar.

SECTION 040120

MASONRY REPAIRS

3. Prefabricate welded end dams and install at all interruptions in the horizontal surface of the flashing.
- C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
  1. Space weep 24 inches o.c..

3.10 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  5. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."

END OF SECTION 040120

SECTION 040122

MASONRY CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cleaning the following:
  - 1. Existing unit masonry surfaces.
  - 2. Existing stone surfaces.

1.3 ALLOWANCES

- A. Allowances for cleaning masonry are specified in Section 012100 "Allowances."

1.4 DEFINITIONS

- A. Very Low-Pressure Spray: Under 100 psi.
- B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.
- C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.
- D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to cleaning masonry including, but not limited to, the following:
    - a. Verify masonry-cleaning equipment and facilities needed to make progress and avoid delays.
    - b. Materials, and material application.
    - c. Sequencing and scheduling of work.
    - d. Cleaning program.
    - e. Coordination with building occupants.

SECTION 040122

MASONRY CLEANING

1.6 ACTION SUBMITTALS

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

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For mason.
- B. Cleaning program.

1.8 QUALITY ASSURANCE

- A. Mason: Engage an experienced masonry restoration firm to perform work of this Section. Submit a list of a minimum of five (5) projects similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. The list shall include project name, location, and description of work and completion date. Experience installing standard unit masonry is not sufficient.
- B. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used; protection of surrounding materials; and control of runoff during operations. Include provisions for supervising worker performance and preventing damage.
  - 1. If materials and methods other than those indicated are proposed for any phase of cleaning work, add a written description of such materials and methods, including evidence of successful use on comparable projects and demonstrations to show their effectiveness for this Project.
- C. Mockups: Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Cleaning: Clean an area approximately 4-feet for each type of masonry and surface condition.
    - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.
    - b. Test cleaners for different dwell times if instructed by manufacturer.
    - c. Sample areas in inconspicuous area unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work.
    - d. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
    - e. Keep mock ups available for comparison throughout the cleaning project.



SECTION 040122

MASONRY CLEANING

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry-cleaning work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Clean masonry surfaces only when air temperature is 50 deg F and above and is predicted to remain so for at least seven days after completion of cleaning.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.

PART 2 - PRODUCTS

2.1 PAINT, GRAFFITI REMOVERS

- A. Alkaline Paste Paint Remover: Manufacturer's standard alkaline paste or gel formulation, for removing paint from masonry; containing no methanol, methylene chloride, or chlorinated solvents, water rinseable and nonflammable
  1. Basis-of-Design Product: Subject to compliance with requirements, provide PROSOCO, Inc., Sure Klean® Heavy Duty Paint Stripper followed by Sure Klean® Limestone & Masonry Afterwash or comparable product by one of the following:
    - a. American Building Restoration Products, Inc.
    - b. Cathedral Stone Products, Inc.
    - c. Hydroclean; Hydrochemical Techniques, Inc.

2.2 CLEANING MATERIALS

- A. Cleaner for efflorescence and rust removal: Manufacturer's standard liquid formulation, with pH between 1 and 3, formulated for cleaning efflorescence and mortar smears from masonry surfaces.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide Cathedral Stone Products, Inc.; Light Duty Rust Remover. or a comparable product by one of the following:

SECTION 040122

MASONRY CLEANING

- a. PROSOCO, Inc.
  - b. Hydroclean; Hydrochemical Techniques, Inc.
- B. Cleaner for biological soiling: Manufacturer's standard alkaline liquid cleaner formulated for removing mold, mildew, and other biological soiling from masonry surfaces.
1. Basis-of-Design Product: Subject to compliance with requirements, provide PROSOCO, Inc., Enviro Klean® ReKlaim Cleaner and Activator with Sure Klean® Limestone & Masonry Afterwash or comparable product by one of the following:
    - a. American Building Restoration Products, Inc.
    - b. Cathedral Stone Products, Inc.
    - c. Hydroclean; Hydrochemical Techniques, Inc.
- C. Cleaner for environmental soiling, carbon crusting: Manufacturer's standard system consisting of alkaline prewash cleaner and acidic afterwash cleaner that does not contain hydrofluoric acid.
1. Basis-of-Design Product: Subject to compliance with requirements, provide PROSOCO, Inc, Sure Klean® 766 Limestone and Masonry Prewash, with Sure Klean® Limestone & Masonry Afterwash or Sure Klean Restoration® Cleaner for neutralization or comparable product by one of the following:
    - a. American Building Restoration Products, Inc.
    - b. Hydroclean; Hydrochemical Techniques, Inc.

PART 3 - EXECUTION

3.1 PROTECTION

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

SECTION 040122

MASONRY CLEANING

- B. Remove gutters and downspouts and associated hardware adjacent to immediate work area and store during masonry cleaning. Reinstall when masonry cleaning is complete.
  - 1. Provide temporary rain drainage during work to direct water away from building.

3.2 CLEANING MASONRY, GENERAL

- A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.
- B. Proceed with cleaning in an orderly manner; work from bottom to top of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.
- C. Use only those cleaning methods indicated for each masonry material and location.
  - 1. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
  - 2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.
    - a. Equip units with pressure gages.
    - b. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone-shaped spray.
    - c. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
    - d. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
    - e. For steam application, use steam generator capable of delivering live steam at nozzle.
- D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.
- E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.
- F. Water Application Methods:
  - 1. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from masonry surface and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

## SECTION 040122

### MASONRY CLEANING

- G. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
- H. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
  - 1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.
- I. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

### 3.3 PRELIMINARY CLEANING

- A. Removing Plant Growth: Consult with Owner prior to removal of any visible vegetation. Following approval by Owner, completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing remaining growth to dry as long as possible before removal. Remove loose soil and plant debris from open joints to whatever depth they occur.
- B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, calking, asphalt, and tar.
  - 1. Carefully remove heavy accumulations of rigid materials from masonry surface with sharp chisel. Do not scratch or chip masonry surface.
  - 2. Remove paint and calking with alkaline paint remover.
    - a. Comply with requirements in "Paint Removal" Article.
    - b. Repeat application up to two times if needed.
  - 3. Remove asphalt and tar with solvent-type paste paint remover.
    - a. Comply with requirements in "Paint Removal" Article.
    - b. Apply paint remover only to asphalt and tar by brush without prewetting.
    - c. Allow paint remover to remain on surface for 10 to 30 minutes.
    - d. Repeat application if needed.

### 3.4 PAINT REMOVAL

- A. Paint-Remover Application, General: Apply paint removers according to paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

## SECTION 040122

### MASONRY CLEANING

#### B. Paint Removal with Alkaline Paste Paint Remover:

1. Remove loose and peeling paint using low to medium pressure water spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply approximately 1/8 inch coat of stripper using brushes or rollers.
3. Leave paint stripper on the surface until the paint is obviously "lifted" or dissolved. If stripper is left on the surface unattended, take precautions to prevent pedestrians from coming near treated surfaces.
4. Using pressure-rinsing equipment and working from the bottom of the treated surface to the top, thoroughly rinse the stripper and solubilized paint from the surface. Use as much water as possible. The best combination of rinsing pressure and water volume is provided by masonry washing equipment generating 400-1000 psi with a water flow rate of 6-8 gallons per minute delivered through a 20-45 degree fan spray tip. Equipment should be adjustable to reduce water flow rate and rinsing pressure as required for controlled cleaning of more sensitive surfaces.
5. Repeat process if needed. Shorter dwell times are usually enough on second applications where only a little paint remains.
6. Apply acidic cleaner or manufacturer's recommended afterwash to surface, while surface is still wet, using low-pressure spray equipment or soft-fiber brush. Let cleaner or afterwash remain on surface as a neutralizing agent for period recommended in writing by chemical-cleaner or afterwash manufacturer.
7. Rinse the treated area thoroughly. Remove all traces of paste residue and solubilized paint coatings. Note: When rinsing, heated water (150-180°F; 65-82°C) improves removal efficiency and reduces rinse water and liquid waste.
8. Using pH papers, pH pen or pH indicator solutions, check treated surfaces to ensure neutralization has been achieved. Repeat steps 6-7 above if needed until surface pH is 5.0 to 9.0.
9. Let neutralized surface dry thoroughly. Before applying new surface coatings, check the cleaned surface again using pH papers, pH pen or pH indicator solutions. Check that surface pH is neutral. Inadequate neutralization may cause surface discoloration or failure of new surface coatings.

### 3.5 CLEANING MASONRY

#### A. Rust Staining/ Efflorescence Removal:

1. Wet surface with water applied by low-pressure spray.
2. Apply thick, even layer of cleaner by brush or roller onto wet/ damp substrate.
3. Leave cleaner on surface for approximately 20-40 minutes.
4. If the rust is extremely thick a second application may be needed. If product begins to dry a second layer of product may be applied directly over the existing one.
5. After allowing the product to dwell, rinse the surface with copious amounts of water (pressure washer). Do not allow run off to dry on other surfaces.

#### B. Mold, Mildew, and Algae Removal:

1. Working from bottom to top, apply prepared cleaning solution to a dry surface.

## SECTION 040122

### MASONRY CLEANING

2. Leave solution on the surface for 5 to 20 minutes. If solution begins to dry, reapply.
3. Gently scrub heavily soiled areas.
4. Rinse thoroughly with clean water. If using a sponge or string mop to rinse, change rinse water often. Pressure rinse porous surfaces to remove heavy soiling.
5. Immediately after rinsing cleaning solution from masonry surface, apply the acidic neutralizer to the wet surface.
6. Let the afterwash stay on the surface for 3 to 5 minutes.
7. Pressure rinse from the bottom of the treated area to the top. Make sure to cover each portion of the masonry surface with a concentrated stream of water. To avoid streaking, keep wall surfaces immediately below area being cleaned wet and free of cleaner rundown and residues.

C. Two-Part Chemical Cleaning for heavy atmospheric staining and carbon crusting:

1. Wet surface with hot water applied by low-pressure spray.
2. Apply alkaline prewash cleaner to surface by brush or roller.
3. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer unless otherwise indicated.
4. Rinse with hot water applied by medium-pressure spray to remove chemicals and soil.
5. Apply acidic afterwash cleaner to surface in two applications (if required), while surface is still wet, using deep-nap roller or soft-fiber brush. Let neutralizer remain on surface for period recommended in writing by manufacturer unless otherwise indicated.
6. Rinse with cold water applied by medium-pressure spray to remove chemicals and soil. Rinse until surface reaction value is between pH 5 and pH 9 according to pH-measuring paper, pen, or indicator solution.
7. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once.

### 3.6 FINAL CLEANING

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

END OF SECTION 040110

SECTION 044200

EXTERIOR STONE CLADDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stone panels set with individual anchors at rear entrance door.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for steel framing and supports for door opening.
2. Section 076200 "Sheet Metal Flashing and Trim" for concealed metal flashing and end dams.

1.2 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Shop Drawings: Show fabrication and installation details for stone cladding assembly, including dimensions and profiles of stone units.

1. Show locations and details of joints both within stone cladding assembly and between stone cladding assembly and other construction.
2. Show locations and details of anchors.
3. Show direction of veining, grain, or other directional pattern.

C. Stone Samples: Sets for each variety, color, and finish of stone required; not less than 12 inches square.

D. Colored Pointing Mortar Samples: For each color required.

E. Sealant Samples: For each type and color of joint sealant required.

1.3 INFORMATIONAL SUBMITTALS

- A. Mason: Engage an experienced masonry restoration firm to perform work of this Section. Submit a list of a minimum of five (5) completed projects similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. The list shall include project name, location, and description of work and completion date. Experience installing standard unit masonry is not sufficient.

## SECTION 044200

### EXTERIOR STONE CLADDING

#### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate stone cladding assemblies similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: A firm or individual experienced in installing stone cladding assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
  - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
  - 2. Store stone on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.

#### 1.6 FIELD CONDITIONS

- A. Protect stone cladding during erection by doing the following:
  - 1. Cover tops of stone cladding installation with nonstaining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.
  - 2. Prevent staining of stone from mortar, grout, sealants, and other sources. Immediately remove such materials without damaging stone.
  - 3. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
  - 4. Protect sills, ledges, and projections from mortar and sealant droppings.
- B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace stone cladding damaged by frost or freezing conditions. Comply with cold-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.
- C. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.



SECTION 044200

EXTERIOR STONE CLADDING

- D. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F or when joint substrates are wet.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Design stone anchors and anchoring systems according to ASTM C1242.
  - 1. Stone anchors withstand not less than two times the weight of the stone cladding in both compression and tension.
- B. Structural Performance: Stone cladding assembly withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Wind Loads: As indicated in Drawings.
- C. Seismic Performance: Stone cladding assembly withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. Component Importance Factor: 1.0.
- D. Safety Factors for Stone: Design stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:
  - 1. Safety Factor for Oolitic Limestone: 8.

2.2 LIMESTONE

- A. Material Standard: Comply with ASTM C568/C568M.
  - 1. Classification: II Medium-Density.
- B. Description: Oolitic limestone.
- C. Varieties and Sources: Subject to compliance with requirements, provide Indianan Limestone that matches existing adjacent stone units.
- D. Varieties and Sources: Indiana limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
  - 1. Indiana Limestone Grade and Color: Select, buff, according to grade and color classification established by ILI.
- E. Finish: As selected by Architect to match existing limestone.

## SECTION 044200

### EXTERIOR STONE CLADDING

- F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

#### 2.3 ANCHORS AND FASTENERS

- A. Fabricate anchors, including shelf angles, from stainless steel, ASTM A240/A240M or ASTM A666, Type 316; temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A276, Type 316.
- B. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.
  - 1. For stainless steel, use annealed stainless steel bolts, nuts, and washers; for bolts, ASTM F593; and for nuts, ASTM F594, Alloy Group 2.

#### 2.4 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I, except Type III may be used for cold-weather construction, natural color or white as required to produce mortar color indicated.
  - 1. Low-Alkali Cement: Portland cement for use with limestone contains no more than 0.60 percent total alkali when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207.
- C. Aggregate: ASTM C144; except for joints narrower than 1/4 inch, 100 percent pass the No. 8 sieve and 95 percent pass the No. 16 sieve.
- D. Water: Clean, non-alkaline and potable.

#### 2.5 STONE ACCESSORIES

- A. Setting Shims: Strips of resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.
- B. Concealed Sheet Metal Flashing: Fabricated from stainless steel in thicknesses indicated, but not less than 0.0156 inch thick, and complying with Section 076200 "Sheet Metal Flashing and Trim."
- C. Weep and Vent Tubes: Medium-density polyethylene tubing, 1/4-inch OD, of length required to extend from exterior face of stone to cavity behind.
- D. Sealants for Joints in Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and do not stain stone:

PROJECT No. 16228E-03-01  
044200-4

EXTERIOR STONE CLADDING

## SECTION 044200

### EXTERIOR STONE CLADDING

1. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.
- E. Sealant for Filling Kerfs: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and that do not stain stone:

#### 2.6 FABRICATION OF STONE

- A. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.
- B. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.
- C. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples.
- D. Cut stone to produce uniform joints 3/8 inch wide and in locations indicated.
- E. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
- F. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.

#### 2.7 MORTAR MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions. Do not use admixtures, unless otherwise indicated.
- B. Portland Cement-Lime Setting Mortar: Comply with ASTM C270, Proportion Specification, Type N.
  1. Set limestone with Type N mortar.
- C. Pointing Mortar: Comply with ASTM C270, Proportion Specification, Type N. Provide pointing mortar mixed to match Architect's sample and complying with the following:

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF STONE CLADDING, GENERAL

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

## SECTION 044200

### EXTERIOR STONE CLADDING

- B. Execute stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone.
- C. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.
- D. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water, to divert water to building exterior. Extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
- E. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.
  - 1. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and above shelf angles and flashing. Locate weep holes at intervals not exceeding 24 inches.

#### 3.2 INSTALLATION OF MECHANICALLY ANCHORED STONE CLADDING

- A. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C1242.
- B. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.
- C. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

#### 3.3 INSTALLATION OF STONE CLADDING WITH MORTAR

- A. Set stone in full bed of mortar with head joints filled unless otherwise indicated.
  - 1. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.
- B. Embed ends of sills in mortar; leave remainder of joint open until final pointing.
- C. Rake out joints for pointing with mortar to depths of not less than 1/2 inch. Rake joints to uniform depths with square bottoms and clean sides.

## SECTION 044200

### EXTERIOR STONE CLADDING

- D. Point stone joints by placing pointing mortar in layers not more than 3/8 inch. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- E. Tool joints with a round jointer having a diameter 1/8 inch larger than width of joint, when pointing mortar is thumbprint hard.
- F. Rake out mortar from sealant-pointed joints to depths required for sealant and sealant backing, but not less than 1/2 inch. Rake joints to uniform depths with square bottoms and clean sides.

#### 3.4 INSTALLATION OF JOINT SEALANTS

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

#### 3.5 INSTALLATION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, corners and jambs within 20 feet of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch in 40 feet or more.
- B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.
- C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- D. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch or a quarter of nominal joint width, whichever is less. For joints within 60 inches of each other, do not vary more than 1/8 inch or a quarter of nominal joint width, whichever is less from one to the other.
- E. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units.

#### 3.6 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone cladding as work progresses. Remove excess sealant and smears as sealant is installed.
- B. Final Cleaning: Clean stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION 044200

## SECTION 055000

### METAL FABRICATIONS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

1. Steel framing and supports for operable partitions.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Shelf angles.
4. Metal floor plate and supports.
5. Miscellaneous steel trim including steel angle corner guards and steel edgings.
6. Pipe guards.
7. Loose bearing and leveling plates for applications where they are not specified in other Sections.
8. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

##### 1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Requirements:
  1. Section 051200 "Structural Steel Framing" for steel framing, supports, divider beams, door frames, and other steel items attached to the structural-steel framing.

##### 1.3 PRICE AND PAYMENT PROCEDURES

- A. See Part 4 – MEASUREMENT AND PAYMENT

##### 1.4 REFERENCE STANDARDS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304 or Type 316L.
- C. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304 or Type 316L.
- D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

- E. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.
- F. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- G. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

## 1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
  - 2. Fasteners.
  - 3. Shop primers.
  - 4. Shrinkage-resisting grout.
- B. Shop Drawings: Show fabrication and installation details. Include analysis and design data signed and sealed by the qualified professional engineer by the State of New York responsible for their preparation. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  - 1. Hatches framing and supports.
  - 2. Steel, aluminum, and stainless-steel framing and supports for operable winches.
- C. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- D. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.
- E. Welding certificates.
- F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

## 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel framing to prevent bending and damage.

## 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

### 2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 or Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless steel fasteners for fastening aluminum and stainless steel.
  - 2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
- C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593 (ASTM F738M); with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy Group 1 (A1).
- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

### 2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings".
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.



- D. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 4000 psi (20 MPa).

#### 2.4 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with primer specified in Section 099600 "High-Performance Coatings" where indicated.

#### 2.5 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
  - 1. Provide mitered and welded units at corners.
  - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.

#### 2.6 METAL FLOOR PLATE

- A. Fabricate from rolled-aluminum-alloy tread plate of thickness indicated below:
  - 1. Thickness: As indicated.
- B. Provide grating sections where indicated, fabricated from pressure-locked aluminum bar grating. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
- C. Provide steel angle supports as indicated.

## 2.7 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize miscellaneous steel trim.

## 2.8 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  - 1. Cast Aluminum: Heavy coat of bituminous paint.
  - 2. Extruded Aluminum: Two coats of clear lacquer.

### 3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
  - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.
  - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

### 3.3 REPAIRS

- A. Touchup Painting:
  - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    - a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
  - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

## SECTION 055100

### METAL STAIRS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Stainless Steel treads, riser and intermediate landings.
  - 2. Stainless steel railings and guards.
  - 3. Hot-dip galvanized stringers and pipe support posts, bracing and incidental framing.
  - 4. Design calculations for the above.
- B. Related Sections:
  - 1. Division 03 3000 "Cast-in-Place Concrete: for concrete foundations.

##### 1.3 PREINSTALLATION MEETINGS

- A. Review shop and field quality control testing procedures, including Special Inspections, which are different than Quality Control testing by the CQMR.

##### 1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs, railings, and guards.
  - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
  - 2. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

- D. Schedule installation of railings and guards so wall attachments are made only to completed walls.
  - 1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For metal stairs and railings.
- B. Shop Drawings:
  - 1. Provide shop drawings sealed and signed by a Pennsylvania Licensed Professional Engineer that prepared calculations.
  - 2. Include plans, elevations, sections, details, and attachment to other work.
  - 3. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
  - 4. Include plan at each level.
  - 5. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails at top landing.
- C. Delegated Design Submittal: For stairs, railings, and guards, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Submit comprehensive engineering analysis, including calculations structural analysis data and details of anchorage and supports indicating compliance performance requirements.
  - 2. Review technical details of metal stairs, landings and railings with respect to design performance criteria, and be responsible for engineering modifications or revisions to details of the stair, landings, and railings as well as details for connections and members not specifically shown on the Drawings. Submit calculations for the following:
    - a. Straight runs.
    - b. Platforms and landings
    - c. Railings and handrails

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Welding certificates.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator/Installer with a minimum five (5) consecutive year experience in the successful fabrication and installation of steel stair and railing systems of the type indicated for this project.

- B. Professional Engineer: Licensed to practice in the Commonwealth of Pennsylvania, and responsible for preparation of calculations and review/stamping of shop drawings.
- C. Welding Qualifications: Qualify the welding procedures and personnel including shop welders, field welders, welding operators and tackers for the following periods of effectiveness according to the following:
  - 1. Welding Reference Standards:
    - a. AWS D1.1, "Structural Welding Code - Steel."
    - b. AWS D1.3, "Structural Welding Code - Sheet Steel."
  - 2. Certification and qualification, including period of effectiveness of welding personnel shall be as specified by AWS D1.1. Certification shall remain in effect for duration of work provided welders are continuously engaged in performing the type of welding for which they are certified, unless welders fail to perform acceptable welding, as determined by the Independent Special Inspection Agency
  - 3. Certification and re-certification of welding personnel is subject to verification by the Testing Agency. Re-testing for re-certification will be the Subcontractor's responsibility.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Architect to be invited to review in-progress fabrication at shop in lieu of on-site mockup or providing a piece of product. Invitation to be extended early enough in process to allow for correction or modification of final product if so required.
  - 2. Provide mockup of one segment of each stair type with intermediate landing, and stringers, and railing specified. Include one run of stairs from post to post including handrail and bracket, steel railings and in fill, plus 4 complete treads (shop mockup).
  - 3. Replace unsatisfactory work as directed until final acceptance by the Architect. Maintain accepted mock-ups throughout Project construction. Mock-up assemblies will be used as a standard for judging acceptability of Work on the Project.
  - 4. Subject to compliance with the requirements, approved mockups may become part of the completed work if undisturbed at time of substantial completion.

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls slab openings, structure and other field conditions and construction contiguous with metal fabrications by field measurements before fabrication.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
  - 1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
  - 2. Protect steel members and packaged materials from corrosion and deterioration.
  - 3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
    - a. Repair or replace damaged materials or structures as directed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified and licensed professional engineer to design stairs, railings, and guards, including attachment to building construction, using performance requirements and design criteria indicated. Review the technical details of the metal stairs and landings with respect to design performance criteria, and be responsible for engineering modifications or revisions to details of the stair and landings as well as the design of details for connections and members not specifically shown on the Drawings.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
  - 1. Steel: 72 percent of minimum yield strength.
- C. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Uniform Load: 100 lbf/sq. ft..
  - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
  - 3. Uniform and concentrated loads need not be assumed to act concurrently.
  - 4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
  - 5. Deflection: Limit deflection of treads, platforms, landings, and framing members to L/360 or 1/4 inch, whichever is less, due to live loads. Total load L/240. Global total deflection of 3/4 inch for entire system.
  - 6. Vibration: Limit frequency of entire system to min. 5 Hz. Apply a 600 pound load vertically and limit deflection under this load to 1/8 in. Apply a 200 pound load laterally and limit deflection under this load to 1/8 inch.
  - 7. Internal Pressure Loads: 5 psf internal pressure loading.
  - 8. Camber: Camber for dead load of stair shall be used in order for stairs to be installed level.
- D. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ft. per linear ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  - 2. Infill of Guards:
    - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
    - b. Infill load and other loads need not be assumed to act concurrently.
- E. Seismic Performance of Stairs: Metal stairs withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.15.
- F. Static Coefficient of Friction: Provide finish to provide a minimum static coefficient of friction of 0.6 in compliance with ASTM C1028

## 2.2 METALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
1. Surface Flatness and Edges: For exposed Work provide materials which have been produced to the highest commercial standard (for fire stairs) and highest architectural standard (for Cobus Stair) for flatness with edges and corners sharp and true to angle or curvature as required.
  2. Alloys and Tempers: Provide the specific alloy which will weld and machine properly, and will finish to match the Architect's sample. Use the temper or hardness which will provide the greatest strength and durability, consistent with necessary forming, fabrication and finishing processes.
  3. Exposed Surfaces: For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36.
- C. Stainless Steel: ASTM A276, Type 316L – Standard Specifications for Stainless Steel Bars and Shapes.
- D. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads. F. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- E. Provide galvanized finish for exterior installations and where indicated.

## 2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.
1. Select fasteners for type, grade, and class required.
- B. Fasteners for Anchoring Railings and Guards to Other Construction: Provide adhesive or adhesive hollow-wall structural anchors to fasten to brick masonry wall. Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.
- C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.



- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
  - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.
- E. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
  - 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Welding Electrodes: Comply with AWS requirements.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with ASTM A780/A780M and compatible with paints specified to be used over it.
- C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

#### 2.5 FABRICATION, GENERAL

- A. Provide metal stairs and platforms of the design shown. Comply with specified "Performance Criteria". Include supplementary parts necessary to complete commercial and architectural metal stair work though not definitely shown or specified.
- B. Provide complete stair assemblies, including metal framing, hangers, railings, guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
- C. Assemble stairs, railings, and guards in shop to greatest extent possible.
  - 1. Disassemble units only as necessary for shipping and handling limitations.
  - 2. Clearly mark units for reassembly and coordinated installation.
- D. Cut, drill, and punch metals cleanly and accurately.
  - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
  - 2. Remove sharp or rough areas on exposed surfaces.
- E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Form exposed work with accurate angles and surfaces and straight edges.

- G. Completely assemble and weld members before milling of surfaces.
- H. Fabricate members with the natural camber pointing up. Provide shop-induced camber for members as indicated.
- I. Assemble built-up sections by welding and make free of warpage with axes in true alignment.
- J. Weld connections to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Weld exposed corners and seams continuously unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter.
- K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
  - 1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
  - 2. Locate joints where least conspicuous.
  - 3. Fabricate joints that are exposed to weather in a manner to exclude water.
  - 4. Provide weep holes where water may accumulate internally.

## 2.6 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
  - 1. Fabricate stringers of steel channels.
    - a. Stringer Size: As indicated on Drawings.
    - b. Provide closures for exposed ends of channel stringers.
    - c. Finish: Galvanized.
  - 2. Construct platforms and tread supports of steel plate or channel headers and miscellaneous framing members as indicated on Drawings.
    - a. Provide closures for exposed ends of channel framing.
    - b. Finish: Galvanized.
  - 3. Weld stringers to headers; weld framing members to stringers and headers.
  - 4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Perforated Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."

1. Fabricate treads and platforms from welded steel grating with openings in gratings no more than **1/8 inch** in least dimension.
    - a. Surface: Serrated or non slip.
    - b. Finish: Mill finish type 316 stainless steel..
  2. Fabricate perforated platforms with nosing matching that on grating treads.
    - a. Secure grating to platform framing by welding.
- D. Risers: Solid.

## 2.7 FABRICATION OF STAIR RAILINGS AND GUARDS

- A. Provide metal stairs and platforms of the design shown. Comply with specified "Performance Criteria". Include supplementary parts necessary to complete commercial and architectural metal stair work though not definitely shown or specified.
- B. Steel Tube Railings and Guards: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
1. Rails and Posts:
    - a. Top Rails: 1-1/2-inch square top rails; Type 316 Stainless Steel.
    - b. Bottom Rails: 1-1/2-inch x3/4-inch bottom rail; Type 316 Stainless Steel.
    - c. Posts: 1-1/2-inch- square posts; Type 316 Stainless Steel.
  2. Picket Infill: 3/4-inch- square pickets spaced 4 inches o.c. to prohibit the passage of a 4-inch (100-mm) diameter sphere. Type 316 Stainless Steel.
  3. Handrails: 1-1/2 inch diameter stainless steel tube handrail.
- C. Welded Connections: Fabricate railings and guards with welded connections.
1. Fabricate connections that are exposed to weather in a manner that excludes water.
    - a. Provide weep holes where water may accumulate internally.
  2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
  3. Weld all around at connections, including at fittings.
  4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  5. Obtain fusion without undercut or overlap.
  6. Remove flux immediately.
- D. Form changes in direction of railings and guards as follows:
1. By bending or by inserting prefabricated elbow fittings.
- E. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required.
1. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- F. Close exposed ends of railing and guard members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- H. Connect posts to stair framing by direct welding unless otherwise indicated.
- I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
1. Connect posts to stair framing by direct welding unless otherwise indicated.
  2. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

## 2.8 FINISHES

- A. Finish metal stairs after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
- C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Examine openings and conditions to which the stairs are to be attached and confirm that openings are square and in compliance with shop drawings and installation tolerances. Notify Subcontractor if conditions are detrimental to the proper and expeditious installation of the work. Starting the work shall indicate acceptance of the surfaces and conditions to perform the work as specified.

### 3.2 PREPARATION

- A. Prepare in place steel framing to receive stairs. If spray fireproofing is in place do not remove more than is necessary to accomplish the welded or bolted connections.

### 3.3 INSTALLATION OF METAL STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
  - 1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
  - 2. Provide adhesive or adhesive hollow-wall structural anchors to fasten to brick masonry wall.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
  - 1. Grouted Baseplates: Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces.
    - a. Clean bottom surface of baseplates.
    - b. Set steel-stair baseplates on wedges, shims, or leveling nuts.
    - c. After stairs have been positioned and aligned, tighten anchor bolts.
    - d. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
    - e. Promptly pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
      - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
      - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints.
  - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
  - 2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
  - 3. Comply with requirements for welding in "Fabrication, General" Article.

### 3.4 INSTALLATION OF RAILINGS AND GUARDS

- A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
  - 1. Space posts at spacing indicated or, if not indicated, as required by design loads.
  - 2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.
  - 3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet.
  - 4. Secure posts, rail ends, and guard ends to building construction as follows:
    - a. Anchor posts to steel by welding to steel supporting members.
    - b. Anchor handrail and guard ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.
- B. Attach handrails or guards to wall with wall brackets as indicated in drawings.
  - 1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
  - 2. Secure wall brackets to building construction as follows:
    - a. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
    - b. For hollow masonry anchorage, use toggle bolts.
    - c. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

### 3.5 FIELD QUALITY CONTROL

- A. City of Philadelphia Special Inspections: engage a qualified special inspector to perform the necessary inspections and provide reports required by City.
  - 1. Special Inspections: the following may be included, but not limited to:
    - a. Steel Fabrications
    - b. Welding
  - 2. Inspection Agency: Engage a qualified independent inspection and testing agency to perform shop and on-site tests and inspections according to City of Philadelphia requirements.
  - 3. Inspect the structural steel fabrication, welding, bolting and erection as Work progresses, per City requirements. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate the Design Professional for final acceptance.
    - a. Field inspection of steel shall include connections, levelness, plumbness and alignment of the stair and railing systems in conformance with AWS welding methods, examination of surface before welding, examination and testing of completed welds.
    - b. Where testing is required for less than 100% of locations, select test locations at random and throughout the project.
  - 4. If testing finds welds are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.
  - 5. Welds will be considered defective if they do not pass tests and inspections:
  - 6. Remove and replace welds that does not pass tests and inspections, and retest.
  - 7. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

B. Prepare test and inspection reports

3.6 REPAIR

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055119

SECTION 057300

DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Laser-cut aluminum decorative balusters and newel posts.
2. Stainless steel railings.
3. Stainless steel stair brackets.
4. Interior wood stair moldings and rails.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring railings.
2. Section 096400 "Wood Flooring, Treads and Risers" for interior wood stair riser and tread materials.

1.2 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

A. Product Data:

1. Laser-cut aluminum infill panels.
2. Stainless steel rails
3. Fasteners.
4. Post-installed anchors.
5. Handrail brackets.
6. Wood rails.
7. Documentation about species, grade and moisture content for all stair moldings  
woodwork



SECTION 057300

DECORATIVE METAL RAILINGS

- 8. Shop primer.
- 9. Metal finishes.
  
- B. Shop Drawings: Include plans, elevations, sections, and attachment details.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish required.
  - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters
  - 2. Fittings, end caps, and brackets.
  - 3. Welded connections.
  - 4. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and guard infill. Sample need not be full height.
    - a. Show method of connecting and finishing members at intersections.
- E. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For delegated design professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.
- F. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

SECTION 057300

DECORATIVE METAL RAILINGS

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
  - 1. Build mockups as shown on Drawings.
  - 2. Build mockups for each form and finish of railing, consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, are to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  - 2. Infill of Guards:
    - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
    - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

## SECTION 057300

### DECORATIVE METAL RAILINGS

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

#### 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 316L.
- D. Aluminum Sheet: Flat sheet complying with ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties of not less than Alloy 5005-H32.
- E. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

#### 2.3 LASER-CUT ALUMINUM BALUSTERS AND NEWELS

- A. Source Limitations: Obtain aluminum decorative railing components from single source from single manufacturer.
- B. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- C. Plate and Sheet: ASTM B209, Alloy 5005-H32.
- D. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.
- E. Metal Infill Panels: Aluminum sheet, ASTM B209, Alloy 6061-T6, 0.5 inch thick,.

#### 2.4 STAINLESS STEEL RAILINGS

- A. Source Limitations: Obtain stainless steel decorative railing components from single source from single manufacturer.
- B. Tubing: ASTM A554, Grade MT 316L.
- C. Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 316L.
- D. Bars and Shapes: ASTM A276/A276M, Type 316L.

SECTION 057300

DECORATIVE METAL RAILINGS

2.5 FASTENERS

A. Fastener Materials:

1. Aluminum Railing Components: Type 316 stainless steel fasteners.
2. Stainless Steel Railing Components: Type 316 stainless steel fasteners.
3. Hot-Dip Galvanized-Steel Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
4. Dissimilar Metal Railing Components: Type 316 stainless steel fasteners.
5. Finish exposed fasteners to match appearance, including color and texture, of railings.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.

1. Provide tamper-resistant square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

2.6 INTERIOR WOOD STAIR MOLDINGS AND RAILINGS

A. Wood Rails:

1. Clear, straight-grained hardwood rails secured to metal balusters and newel posts.
  - a. Species: Red oak, match existing treads and risers.
  - b. Finish: Transparent polyurethane.
  - c. Staining: As selected by Architect from manufacturer's full range.
  - d. Profile: As indicated on Drawings.

B. Wood Stair Moldings and Trim:

1. Architectural Woodwork Standards Grade: Premium.
2. Wood for Transparent Finish, species and cut:
  - a. Moldings, fascia: Red oak, quarter sawn, match existing.
  - b. Risers: See Section 096400.
  - c. Treads: See Section 096400.
3. Wood Moisture Content: 5 to 10 percent.

Wood for Opaque Finish, species: Any closed-grain hardwood, except that eastern white pine, sugar pine, or western white pine may be used for risers, stringers, and moldings.

4. Wood Moisture Content: 5 to 10 percent.

SECTION 057300

DECORATIVE METAL RAILINGS

C. Finishes for Stair Parts:

1. Treads: Transparent.
2. Risers: Transparent.
3. Stringer Trims: Opaque.
4. Handrails: Transparent.
5. Scotia, Cove, and Other Moldings: Transparent.

D. Comply with requirements in Section 064023 "Interior Architectural Woodwork."

2.7 HANDRAIL BRACKETS

E. Handrail Brackets: Cast stainless steel with wall flange drilled and tapped for concealed hanger bolt and with support arm for screwing to underside of rail. Size to provide 1-1/2-inch clearance between handrail and face of wall.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Julius Blum & Co., Inc., Model Numbers as indicated on Drawings, or a comparable product by one of the following:
  - a. The Wagner Companies.
2. Provide stainless steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.

2.7 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099123 "Interior Painting."

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Intermediate Coats and Topcoats: Provide products that comply with Section 099123 "Interior Painting."

2.8 FABRICATION

A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

SECTION 057300

DECORATIVE METAL RAILINGS

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
  2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water.
1. Provide weep holes where water may accumulate.
  2. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded or mechanical connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove flux immediately.
  4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
- I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.
1. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  2. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form changes in direction as follows:
1. As detailed.
  2. By bending to smallest radius that will not result in distortion of railing member.
- K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.
- N. Wood railings:

## SECTION 057300

### DECORATIVE METAL RAILINGS

1. Install rails with no more than 1/8 inch in 96-inch variation from a straight line.
  2. Stair Rails: Glue and dowel or pin railings to balusters and newel posts.
    - a. Secure with countersunk, concealed fasteners and blind nailing.
    - b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with wood surface.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

#### 2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

#### 2.10 ALUMINUM FINISHES

- A. Mechanical Finish: AA-M3x; sand top rails, handrails, and intermediate rails in one direction only, parallel to length of railing, with 120- and 320-grit abrasive. After installation, polish railings with No. 0 steel wool immersed in paste wax, then rub to a luster with a soft dry cloth.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  1. Color and Gloss: As selected by Architect from manufacturer's full range.

#### 2.11 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

SECTION 057300

DECORATIVE METAL RAILINGS

- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 1. Run grain of directional finishes with long dimension of each piece.
  - 2. When polishing is completed, passivate and rinse surfaces.
  - 3. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Stainless Steel Tubing Finishes:
  - 1. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
- D. Stainless Steel Sheet and Plate Finishes:
  - 1. Directional Satin Finish: ASTM A480/A480M, No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
  - 1. Fit exposed connections together to form tight, hairline joints.
  - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
  - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
  - 4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  - 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
  - 1. Coat concealed surfaces of aluminum that will be in contact with masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.



## SECTION 057300

### DECORATIVE METAL RAILINGS

#### 3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

#### 3.4 ANCHORING POSTS

- A. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  - 1. For aluminum railings, attach posts as indicated, using fittings designed and engineered for this purpose.
  - 2. For stainless steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

#### 3.5 ATTACHING RAILINGS

- A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends, using nonwelded connections.
- B. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
  - 1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets and railing end flanges to building construction as follows:
  - 1. For solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.
  - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

#### 3.6 CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

SECTION 057300

DECORATIVE METAL RAILINGS

- B. Clean wood rails by wiping with a damp cloth and then wiping dry.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

SECTION 061053

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including City of Philadelphia Standard Contract Requirements, amendments, and attachments; and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Wood blocking and nailers.
  - 2. Wood furring.
  - 3. Plywood backing panels.
- B. Related Requirements:
  - 1. Section 061516 "Wood Roof Decking".
  - 2. Section 061600 "Sheathing".

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
  - 2. SPIB: The Southern Pine Inspection Bureau.
  - 3. WCLIB: West Coast Lumber Inspection Bureau.
  - 4. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. Include product data for all fasteners.
  - 3. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include

## SECTION 061053

### ROUGH CARPENTRY

physical properties of treated materials based on testing by a qualified independent testing agency.

4. For fire-retardant treatments specified to be High-Temperature (HT) type include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
5. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
6. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
  1. Power-driven fasteners.
  2. Pre-drilling for anchor devices
  3. Preservative-treated wood.
  4. Fire-retardant-treated wood.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  3. Provide dressed lumber, S4S, unless otherwise indicated.

#### 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA C.

## SECTION 061053

### ROUGH CARPENTRY

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated below:
  1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, blocking, and similar concealed members in contact with masonry or concrete.
  3. Wood furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  4. Wood members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas. Select only first option in subparagraph below if authorities having jurisdiction require quality mark on all materials.

#### 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWWA C20 (lumber).
  1. Use treatment that does not promote corrosion of metal fasteners.
  2. Use Exterior type for exterior locations and where indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- A. Application: Treat items indicated on Drawings, and the following:
  1. Concealed blocking.
  2. Roof construction.
  3. Plywood backing panels.

#### 2.4 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent.
- B. Other Framing: Construction, Stud, or No. 2 grade of any of the following species:
  1. Southern pine; SPIB.
  2. Douglas fir-larch; WCLIB or WWPA.
  3. Douglas fir-south; WWPA.

## SECTION 061053

### ROUGH CARPENTRY

4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

#### 2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
  4. Furring.
- B. Dimension Lumber Items: Construction, or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
  1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
  2. Eastern softwoods; No. 2 Common grade; NeLMA.
  3. Northern species; No. 2 Common grade; NLGA.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

#### 2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

#### 2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Wood Screws: ASME B18.6.1.

## SECTION 061053

### ROUGH CARPENTRY

#### 2.8 METAL FRAMING ANCHORS

- 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. MiTek Industries, Inc.
  - 2. Simpson Strong-Tie Co., Inc.
  - 3. Tamlyn.
- B. Allowable design loads, as published by manufacturer, are to meet or exceed those indicated and of products of manufacturers listed. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
  - 1. Use for wood-preserved-treated lumber and where indicated.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

#### 2.9 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.

## SECTION 061053

### ROUGH CARPENTRY

- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Comply with AWWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Field Treatment: Copper naphthenate.
- G. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
  - 2. ICC-ES evaluation report for fastener.
- H. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

### 3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

### 3.3 PROTECTION

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053



SECTION 061516

WOOD ROOF DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-sawn, wood roof decking to replace areas of deteriorated tongue and groove wood decking.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for dimension lumber items associated with wood roof decking.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For preservative-treated wood products, include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

B. Samples: 24 inches long, showing the range of variation to be expected in appearance of wood roof decking.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of wood roof decking to avoid extended on-site storage and to avoid delaying the Work.

B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood roof decking with surfaces that are to be exposed in the final Work protected from exposure to sunlight.

PART 2 - PRODUCTS

2.1 WOOD ROOF DECKING, GENERAL

A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

## SECTION 061516

### WOOD ROOF DECKING

#### 2.2 SOLID-SAWN WOOD ROOF DECKING

- A. Standard for Solid-Sawn Wood Roof Decking: Comply with AITC 112.
- B. Roof Decking Species:
  - 1. Douglas fir-larch, Douglas fir-larch (North), southern pine, spruce pine-fir (North), western hemlock, or western hemlock (North).
- C. Roof Decking Nominal Size: 2 by 6, match size of existing wood roof decking.
- D. Roof Decking Grade: As required to meet span requirements.
  - 1. Select(ed), Commercial Decking.
  - 2. Dense Standard, Dense Select, Select, Dense Commercial, Commercial Decking.
  - 3. Select(ed) Decking or Select Dex, Commercial Decking or Commercial Dex.
- E. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that are not exposed to view.
- F. Moisture Content: Provide wood roof decking with 15 percent maximum moisture content at time of dressing.
- G. Face Surface: Rough sanded or wire brushed.
- H. Edge Pattern: Square-edged.

#### 2.3 PRESERVATIVE TREATMENT

- A. Pressure treat wood roof decking in accordance with AWWA U1; Use Category UC2.
- B. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  - 1. For exposed items indicated to receive a stained or natural finish, use products that do not contain colorants, bleed through, or otherwise adversely affect finishes.
- C. Use process that includes water-repellent treatment.
- D. After treatment, redry materials to 15 percent maximum moisture content.

#### 2.4 ACCESSORY MATERIALS

- A. Fasteners for Solid-Sawn Roof Decking: Provide fastener size and type complying with AITC 112 for thickness of deck used.
- B. Nails: Common; complying with ASTM F1667, Type I, Style 10.
- C. Fastener Material: Hot-dip galvanized steel.

PROJ. NO. 16228E-03-01

061516-2

WOOD ROOF DECKING

## SECTION 061516

### WOOD ROOF DECKING

- D. Bolts for Anchoring Roof Decking to Walls: Carbon steel; complying with ASTM A307 with ASTM A563 hex nuts and, where indicated, flat washers, all hot-dip zinc coated.
- E. Sealants: Latex, complying with applicable requirements in Section 079200 "Joint Sealants" and recommended by sealant manufacturer and manufacturer of substrates for intended application.
- F. Penetrating Sealer: Clear sanding sealer complying with Section 099300 "Staining and Transparent Finishing" and compatible with topcoats specified for use over it.

#### 2.5 FABRICATION

- A. Shop Fabrication: Where preservative-treated roof decking is indicated, complete cutting, trimming, surfacing, and sanding before treating.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine walls and support framing in areas to receive wood roof decking for compliance with installation tolerances and other conditions affecting performance of wood roof decking.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install solid-sawn wood roof decking to comply with AITC 112.
  - 1. Locate end joints for simple, and combination simple and two-span continuous lay-up.
- B. Anchor wood roof decking, where supported on walls, with bolts as indicated.
- C. Where preservative-treated roof decking must be cut during erection, apply a field-treatment preservative to comply with AWWA M4.
  - 1. For solid-sawn roof decking, use inorganic boron (SBX).
- D. Apply joint sealant to seal roof decking at exterior walls at the following locations:
  - 1. Between roof decking and supports located at exterior walls.
  - 2. Between roof decking and exterior walls that butt against underside of roof decking.
  - 3. Between tongues and grooves of roof decking over exterior walls and supports at exterior walls.

SECTION 061516

WOOD ROOF DECKING

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged roof decking if repairs are not approved by Architect.

3.4 PROTECTION

- A. Provide water-resistive barrier over roof decking as the Work progresses to protect roof decking until roofing is applied.
- B. If, despite protection, inorganic boron (SBX)-treated roof decking becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061516

## SECTION 061600

### SHEATHING

#### 1.1 SUMMARY

##### A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.

##### B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 093013 "Cement Tiling" for cementitious backer units for tiled walls.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.

#### 1.4 QUALITY ASSURANCE

##### A. Testing Agency Qualifications:

1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

SECTION 061600

SHEATHING

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested in accordance with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

- A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- B. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. 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.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame

## SECTION 061600

### SHEATHING

front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials are to comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering in accordance with ASTM D2898. Use for exterior locations and where indicated.
  2. Design Value Adjustment Factors: Treated lumber plywood is to be tested in accordance with ASTM D5516 and design value adjustment factors are to be calculated in accordance with ASTM D6305. Span ratings after treatment are to be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F are to be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all plywood unless otherwise indicated.

#### 2.5 WALL SHEATHING

- A. Plywood Sheathing, Walls: Either DOC PS 1 or DOC PS 2, Exposure 1, Structural I sheathing.
1. Span Rating: Not less than 32/16.
  2. Nominal Thickness: Not less than 1/2 inch.

#### 2.6 ROOF SHEATHING

- A. Plywood Sheathing, Roofs: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.
1. Span Rating: Not less than 48/24.
  2. Nominal Thickness: Not less than 5/8 inch.

#### 2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. For roof and wall sheathing, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

## SECTION 061600

### SHEATHING

- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
  - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
  - 3. ICC-ES evaluation report for fastener.
- D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

### 3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Wall and Roof Sheathing:
    - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.



SECTION 061600

SHEATHING

END OF SECTION 061600

PROJ. NO. 16228E-03-01  
061600-5  
SHEATHING

## SECTION 06 16 00

### MAGNESIUM OXIDE INTERIOR WALL PANELS

#### 1.1 SECTION INCLUDES

- A. Magnesium Oxide (MgO) Panels for use as Interior Wall Sheathing in light-framing applications.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of sheathing product. Include manufacturer's technical data indicating performance properties.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: From ICC NTA for sheathing products.
- B. Product Certifications: From manufacturer, indicating that sheathing products comply with indicated Performance Criteria.
- C. Warranty: Sample unexecuted copy of manufacturer warranty.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Warranty: Executed copy of manufacturer warranty.
- B. Installer's information. Description of finishing techniques and list products used.

#### 1.5 QUALITY ASSURANCE

- A. Provide in-situ mock-up of installation and finishing, including panel joining and finish painting. Min size 4'x8 including at least 1 outside corner. Work is not to proceed without review and written approval from Rebuild/PPR or Architect. On acceptance, mockup may be incorporated into final work.
- B. Finishing and Finish testing:
  1. Prime panels before finishing. Using a primer that is suitable for concrete or masonry.
  2. Test the topcoats and paints prior to completing the entire project.
  3. To properly test the bonding capability of the topcoat:
  4. Brush on or spray a small area of the MagPanel® with paint, let the board dry and cure.
  5. Then make an X with a sharp razor knife,
  6. Apply strong-bonding "duct tape" or equivalent product over the cut. Burnish to insure uniform and complete bonding.
  7. Rip - off tape (like a band-aid.) If the paint stays on the board, this indicates the paint and board have a successful bond.

PROJ. NO. 16228E-03-01

061600-1

MAGNESIUM OXIDE INTERIOR WALL PANELS

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions for storage prior to installation.
  - 1. Store panels horizontally and fully supported.
  - 2. Stored inside in a cool, dry place.
  - 3. Protect the edges and corners, carry boards on their side.
  - 4. Stack boards flat on dunnage, loose wood, matting or other material and not directly on the ground.
  - 5. Do not allow the boards to bow.
  - 6. Do not stack any other materials on top of panels
  - 7. Before installing, acclimate the panels for 48 hours in the room where they will be installed.
  - 8. Microcracking may occur due to temperature and moisture changes and due to stress deflection, wracking or other structural movement. Do not install boards with through-thickness cracking large areas of microcracking that could result in a lack of integrity.
  - 9. Project site should be kept clean. Frequently blow off floors, walls, tools and other areas that may collect dust residue from cutting panels.

## 1.7 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer's standard form in which sheathing manufacturer agrees to repair or replace sheathing products that demonstrate deterioration or failure under normal use due to manufacturing defects within warranty period, when installed according to manufacturer's instructions.
  - 1. Warranty Period for Sheathing Products: 2-years minimum from date of delivery.
  - 2. Warranty shall not include any unreasonable limitations on handling or installation.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. As required on construction documents: Component of Fire-Resistant Assembly in accordance with the following standards: *"UL-263, Standard for Fire Tests of Building Construction and Materials"* and *"ASTM E119, Standard Test Methods for Building Construction and Materials."*

### 2.2 MAGNESIUM OXIDE EXTERIOR SHEATHING PANELS

- A. Panels: Fiberglass reinforced 4'x8' panels. Chemical composition MgO / MgSO<sub>4</sub> without MgCl. Minimum 1 smooth face for ceiling and wall applications, minimum 1 rough face for tile backer applications.
  - 1. Perlite: ±3%
  - 2. Wood fiber: ±5%

#### B.

##### Physical Characteristics

Thickness: Ceilings: 1/2 " (12 mm) min thickness.

PROJ. NO. 16228E-03-01

061600-2

MAGNESIUM OXIDE INTERIOR WALL PANELS

Walls: 5/8" (16mm) min thickness with continuous plywood backer  
Tile Substrate: 1/2 " (12 mm) min thickness.

1. Panel Size: 48 by 96 inches (1220 by 2440mm)
  2. Edge profile: tapered for finishing
- C. Panels identified with stamp or label including report holder, manufacturing facility, production date, and ICC-ES report number.
- D. Mold Resistance: No mold growth observed in accordance with ASTM G21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

## 2.3 FASTENERS

- A. Fasteners, General: Size and type complying with manufacturer's written instructions for project conditions and requirements of authorities having jurisdiction.
- B. Screws:
1. #9 coated or stainless steel screws with self-boring counter-sunk heads
  2. Minimum 1 5/8" minimum length.
- C. Joint compound:
1. Top-quality elastomeric joint compound. Check with the manufacturer of the compound to ensure it is compatible with magnesium oxide board.
  2. Tape and mud: Self-adhesive fiberglass tape and a mud or plaster suitable for moist environments.
- D. Adhesive: Urethane-based adhesive at structural supports and between boards at corners.
- E. Veneer Plaster: See Section 092613 Veneer Plaster.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing spacing and alignment to determine work is ready to receive sheathing. Proceed with sheathing work once conditions meet requirements.
- B. Plan work such that sheathing extends over a minimum of 3 studs. Stagger panel joints.

### 3.2 MAGNESIUM OXIDE SHEATHING INSTALLATION

- A. Sheathing Installation, General:
1. Install sheathing in accordance with manufacturer's written instructions, requirements of applicable and requirements of authorities having jurisdiction.
  2. Panel edges to be backed with framing or blocking]
- B. Sheathing Panel Installation

1. Panels installed parallel or perpendicular to framing.
  2. Cut panels with circular saw or worm drive saw.
  3. Rout the edges using carbide tooling.
  4. Panels may be scored with a razor blade and snapped apart from the smooth side. This method does not provide as clean of an edge. True edges as necessary for joining or bonding with adjacent panels.
  5. To prevent micro-cracking with cuts, glue all corners together.
  6. Install panels leaving a gap between the panels. Wood framing: 1/8" gap; Steel Framing: 1/16" gap.
  7. Stager joints between panels.
  8. Fastener Spacing: Install all fasteners at 90 degrees with face of panel.
    - Minimum Distance from corners: 4"
    - Perimeter spacing: 6" ; 9/16" min edge distance
    - Center Fasteners 12"
  9. For caulked panel joints: install polyethylene backer rods at all panel joints. Width > depth.
  10. The outside corners of the joints to be butted together and bonded with urethane adhesive. Sanded as required for finish application.
- C. Patch small gaps (less than 2 sq. inches) and divots in sheathing with elastomeric patching compound that is intended to be used over concrete/masonry substrates.
- D. Where large repairs are required, cut out damaged area and replace with piece of sheathing, installing in same manner as initial installation. Replacement panels to be no less than 24 inches in width and cover a minimum of 2 spans (3 wall studs). Support patch panel edges with nominal 2x blocking.

-END -

SECTION 064023

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standing and running trim for transparent finish.
2. Interior standing and running trim for opaque finish
3. Interior frames and jambs for opaque finish.
4. Miscellaneous materials.
5. Shop priming.

B. Related Requirements:

1. Section 057300 "Decorative Metal Railings" for interior wood stair moldings, fascia and railings.
2. Section 061053 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing interior architectural woodwork that are concealed within other construction before interior architectural woodwork installation.
3. Section 096400 "Wood Flooring, Treads and Risers" for interior wood stair riser and tread materials.

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including:

1. Documentation about species, grade and moisture content for all interior woodwork.
2. Anchors.
3. Adhesives.
4. Stair Brackets.
5. Stair Railings.

B. Shop Drawings:

1. Include the following:
  - a. Dimensioned plans, elevations, and sections.
  - b. Attachment details.

SECTION 064023

INTERIOR ARCHITECTURAL WOODWORK

2. Show large-scale details.
  3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.
- C. Samples: For each exposed product and for each shop-applied color and finish specified.
1. Size:
    - a. Panel Products: 12 inches by 12 inches.
    - b. Trim/Base/Molding/Railing Products: Not less than 12 inches long, for each species and cut, finished on one side and one edge.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For architectural woodwork manufacturer and Installer.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: An experienced installer who has completed architectural casework similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups of typical interior architectural woodwork as shown on Drawings.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
  3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.
- B. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

SECTION 064023

INTERIOR ARCHITECTURAL WOODWORK

1.7 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.
- B. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.
  - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

2.2 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Premium.
- B. Hardwood Lumber:
  - 1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
  - 2. Species: Match species of existing hardwood floor.
  - 3. Cut: Quarter cut/quarter sawn.
  - 4. Wood Moisture Content: 5 to 10 percent.
  - 5. For base wider than available lumber, glue for width. Do not use veneered construction.



SECTION 064023

INTERIOR ARCHITECTURAL WOODWORK

2.3 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

A. Architectural Woodwork Standards Grade: Premium.

1. Wood Species: Any closed-grain hardwood.
2. Wood Moisture Content: 5 to 10 percent.

2.4 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

A. Architectural Woodwork Standards Grade: Premium.

B. Wood Species: Any closed-grain hardwood.

1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
2. Wood Moisture Content: 5 to 10 percent.

2.5 MISCELLANEOUS MATERIALS

A. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

1. Wood Glues: 30 g/L
2. Multipurpose Construction Adhesives: 70 g/L
3. Architectural Sealants: 250 g/L

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:
  - a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
  - b. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch.

## SECTION 064023

### INTERIOR ARCHITECTURAL WOODWORK

- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.
  - 1. Disassemble components only as necessary for shipment and installation.
  - 2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
  - 3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.
  - 4. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.
    - a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
    - b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.
  
- D. Stairs: Glue treads to risers, and glue and nail treads and risers to carriages.
  - 1. Fabricate stairs with treads and risers no more than 1/8 inch from indicated position and no more than 1/16 inch out of relative position for adjacent treads and risers.

#### 2.7 SHOP PRIMING

- A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.
  
- B. Interior Architectural Woodwork for Opaque Finish: Shop prime with one coat of wood primer as specified in Section 099123 "Interior Painting."
  - 1. Backpriming: Apply one coat of primer, compatible with finish coats, to concealed surfaces of woodwork.
  
- C. Interior Architectural Woodwork for Transparent Finish: Shop-seal concealed surfaces with required pretreatments and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing."
  - 1. Backpriming: Apply one coat of sealer, compatible with finish coats, to concealed surfaces of woodwork.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

SECTION 064023

INTERIOR ARCHITECTURAL WOODWORK

- B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

- A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.
- B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
- C. Install interior architectural woodwork level, plumb, true in line, and without distortion.
  - 1. Shim as required with concealed shims.
  - 2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.
  - 1. Secure with countersunk, concealed fasteners and blind nailing.
  - 2. Use fine finishing nails for exposed fastening, countersunk and filled flush with interior architectural woodwork.
  - 3. For shop-finished items, use filler matching finish of items being installed.
- F. Standing and Running Trim:
  - 1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
  - 2. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary.
  - 3. Scarf running joints and stagger in adjacent and related members.
  - 4. Fill gaps, if any, between top of base and wall with latex sealant, painted to match wall.
  - 5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

3.3 REPAIR

- A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects and to result in interior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade.
- B. Where not possible to repair, replace defective woodwork.

SECTION 064023

INTERIOR ARCHITECTURAL WOODWORK

- C. Field Finish: See Section 099123 "Interior Painting" and Section 099300 "Staining and Transparent Finishing" for final finishing of installed interior architectural woodwork not indicated to be shop finished.

3.4 CLEANING

- A. Clean interior architectural woodwork on exposed and semi-exposed surfaces.

END OF SECTION 064023

SECTION 070150

PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This Section Includes:

1. Roof tear-off.
2. Roof re-cover preparation.
3. Flashing removal.
4. Disposal.

B. Related Requirements:

1. Section 011000 "Summary" for use of premises and for phasing requirements.
2. Section 012200 "Unit Prices" for roof sheathing/ decking replacement.
3. Section 061053 "Rough Carpentry" for wood blocking, nailers and curbs to be replaced.
4. Section 061600 "Sheathing" for replacement of deteriorated plywood sheathing.
5. Section 06 1516 "Wood Roof Decking" for replacement of deteriorated wood decking.

1.2 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.3 DEFINITIONS

- A. EPS: Molded (expanded) polystyrene.
- B. Full Roof Tear-off: Removal of existing roofing system down to existing roof deck.
- C. Partial Roof Tear-off: Removal of selected components and accessories from existing roofing system.
- D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.
- E. Existing to Remain: Existing items of construction that are not indicated to be removed.
- F. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.
- G. Roof Re-Cover Preparation: Existing roofing system is to remain and be prepared for new roof installed over it.

SECTION 070150

PREPARATION FOR REROOFING

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Temporary roofing materials and systems.
- C. Written report on all roof drain testing performed
- D. Photographs or Video: show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.
- E. Product Data: For each type of product.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- B. Regulatory Requirements:
  - 1. Comply with governing EPA notification regulations before beginning roofing removal.
  - 2. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 FIELD CONDITIONS

- A. Existing Roofing System: Indicated on Drawings.
- B. Owner will occupy portions of building immediately below reroofing area.
  - 1. Conduct reroofing so Owner's operations are not disrupted.
  - 2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
  - 3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
- C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
  - 1. Construction Drawings and Project Manual for existing roofing system are provided for Contractor's convenience and information, but they are not a warranty of existing

## SECTION 070150

### PREPARATION FOR REROOFING

conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.

- F. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed to 100 lb/sq ft for rooftop equipment wheel loads and 30 lb/sqft for uniformly distributed loads.
- G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
  - 1. Remove only as much roofing in one day as can be made watertight in the same day.
- H. Hazardous Materials:
  - 1. It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.
    - a. Hazardous materials will be removed by Owner before start of the Work.
    - b. Existing roof will be left no less watertight than before removal.
  - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
    - a. Hazardous materials will be removed by Owner under a separate contract.

## PART 2 - PRODUCTS

### 2.1 TEMPORARY PROTECTION MATERIALS

- A. EPS Insulation: ASTM C578.
- B. Plywood: DOC PS 1, Grade CD, Exposure 1.
- C. OSB: DOC PS 2, Exposure 1.

### 2.2 TEMPORARY ROOFING MATERIALS

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

### 2.3 INFILL AND REPLACEMENT MATERIALS

- A. Use infill materials matching existing roofing system materials unless otherwise indicated.
- B. Wood blocking, curbs, and nailers are specified in Section 061000 "Rough Carpentry."

## SECTION 070150

### PREPARATION FOR REROOFING

- C. Plywood roof sheathing is specified in Section 061600 "Sheathing."
- D. Wood roof decking is specified in Section 06 1516 "Wood Roof Decking."
- E. Fasteners: Factory-coated steel fasteners with metal or plastic plates listed in FM Approvals' RoofNav, and acceptable to new roofing system manufacturer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection of In-Place Conditions:
  - 1. Protect existing roofing system that is not to be reroofed.
  - 2. Loosely lay **1-inch- (25-mm-)** minimum thick, EPS insulation over existing roofing in areas not to be reroofed.
    - a. Loosely lay **15/32-inch (12-mm)** plywood or OSB panels over EPS. Extend EPS past edges of plywood or OSB panels a minimum of **1 inch (25 mm)**.
  - 3. Limit traffic and material storage to areas of existing roofing that have been protected.
  - 4. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
  - 5. Comply with requirements of existing roof system manufacturer's warranty requirements.
- B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
- C. Shut off rooftop utilities and service piping before beginning the Work.
- D. Temporarily displace junction boxes, rooftop conduit and gas lines, or other items that may interfere with work. All required disconnection and reconnection shall be performed by a licensed mechanical/electrical subcontractor as applicable to the work being performed. Schedule shut-offs and disconnections with the Owner
- E. Test existing roof drains to verify that they are not blocked or restricted. See Drawings for additional requirements for roof drain testing and cleaning.
  - 1. Immediately notify Architect of any blockages or restrictions.
- F. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
  - 1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- G. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.



## SECTION 070150

### PREPARATION FOR REROOFING

- H. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
  - 1. Prevent debris from entering or blocking roof drains and conductors.
    - a. Use roof-drain plugs specifically designed for this purpose.
    - b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
  - 2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
    - a. Do not permit water to enter into or under existing roofing system components that are to remain.

### 3.2 ROOF TEAR-OFF

- A. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.
- B. Full Roof Tear-off: Remove existing roofing and other roofing system components down to the existing roof deck.
  - 1. Remove base flashings and counter flashings.
  - 2. Remove perimeter edge flashing.
  - 3. Remove expansion-joint covers.
  - 4. Remove flashings at pipes, curbs, and other penetrations.
  - 5. Remove roof drains indicated on Drawings to be removed.
  - 6. Remove wood blocking, curbs, and nailers.
  - 7. Remove fasteners from deck or cut fasteners off slightly above deck surface.
- D. Remove only as much existing roofing and insulation as can be recovered with new roofing and made watertight the same day or before the arrival of inclement weather.
- E. Perform cutting, drilling, and removals in a manner that will prevent damage to adjoining construction which is to remain.
- F. Prior to any cutting, drilling or removals, investigate both sides of the surface affected.
- G. Notify and coordinate with the Owner's Representative prior to interrupting or disconnecting utilities.

### 3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- A. Verify that new roof system substrate is visibly dry and free of moisture.

## SECTION 070150

### PREPARATION FOR REROOFING

- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.
  - 1. Do not proceed with installation until directed by Architect.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.
  - 1. Do not proceed with installation until directed by Architect.
- D. Replace all deteriorated plywood roof sheathing or wood roof decking.
  - 1. Roof sheathing/ decking replacement will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

#### 3.4 INFILL MATERIALS INSTALLATION

- A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.

#### 3.5 ROOF RE-COVER PREPARATION

- A. Remove mechanically attached roofing fastener buttons projecting above roofing and other substrate irregularities that inhibit existing deck from conforming to substrate.
  - 1. Clean substrate of contaminants, such as dirt, debris, oil, and grease, that can affect adhesion of new roofing.
  - 2. Power vacuum the existing roof deck.
  - 3. Verify that surface is dry by pressing litmus paper to surface areas most likely to retain moisture, such as shaded areas and low spots.
    - a. If paper changes color, surface is too wet to apply foam.

#### 3.6 FLASHING REMOVAL

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

#### 3.7 WALLS:

- A. Completely remove materials by scraping or chipping all loose bituminous materials, mortar fins and mortar and bituminous high spots, roof system components, fasteners, brackets, etc., on masonry walls to provide a suitable substrate.

SECTION 070150

PREPARATION FOR REROOFING

3.6 PENETRATIONS:

- A. Completely remove all bituminous and sealant materials and pipe insulation from the surfaces of all pipes, equipment service lines, supports, walls, etc. that are to receive new bituminous, sealant and/or sheet metal flashing materials.

3.7 WOOD BLOCKING

1. Replace deteriorated wood blocking whether or not scheduled for removal with similar in type and size.

3.8 EXISTING EXPANSION JOINTS

1. Remove existing expansion joint assemblies, rebuild curb and provide watertight assembly at the same time. No water intrusion will be allowed at any time.

3.9 DISPOSAL

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

END OF SECTION 070150

SECTION 074100

PREFORMED METAL STANDING SEAM ROOFING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This section covers the pre-finished, pre-fabricated Architectural standing seam roof system. All metal trim, accessories, fasteners, insulation and sealants indicated on the drawings as part of this section.
- B. Drawings and general provisions of the Contract, including general and Supplementary Conditions and Division 01 Specifications, apply to this section.
- C. Related Work Specified Elsewhere
  - 1. Roof Deck structural steel, flat roof systems, perimeter edge systems. Roof hatches, firestopping not included in this section.

1.02 SUMMARY

- A. Section Includes
  - 1. Factory formed Standing Seam metal roof panels

1.03 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal, and accessories necessary for a complete weathertight roofing system.
- B. References:
  - 1. American Society for Testing and Materials (ASTM)
    - a. ASTM A 653: Steel Sheet, Zinc Coated by the Hot Dip Process
    - b. ASTM A 792: Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot Dip Process
    - c. ASTM B 209: Aluminum and Aluminum Alloy Sheet and Plate
    - d. ASTM B370 Standard Specification for Copper Sheet and Strip for Building Construction
  - 2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
    - a. SMACNA Architectural Sheet Metal Manual, 1993 edition
  - 3. American Iron and Steel Institute (AISI)
    - a. AISI Cold Formed Steel Design Manual
  - 4. Aluminum Association
    - a. Aluminum Design Manual
  - 5. Metal Construction Association
    - a. Preformed metal Wall Guidelines
  - 6. Code References
    - a. ASCE, Minimum Loads for Buildings and Other Structures
    - b. BOCA National Building Codes
    - c. UBC Uniform Building Code
    - d. SBC Standard Building Code

1.04 QUALITY ASSURANCE

- A. Manufacturer and erector shall demonstrate experience of a minimum of ten (10) years in this type of project.
- B. Installer shall demonstrate experience of a minimum of five (5) years in this type of project.
- C. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted.

SECTION 074100

PREFORMED METAL STANDING SEAM ROOFING

1.05 SYSTEM DESCRIPTION

A. Material to comply with:

1. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

1.06 ROOF SYSTEM PERFORMANCE TESTING

A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation or other defects in construction.

B. Roof System shall be designed to meet Standard Building Code Wind Load requirements.

C. Panels to meet:

1. Water Penetration: When tested per ASTM E-283/1680 and ASTM E-331/1646 there shall be no uncontrolled water penetration or air infiltration through the panel joints.
2. UL 2218 - Impact Resistance rated.
3. Wind Uplift Resistance: Class 90 rating, minimum, when tested in accordance with UL 580.

1.07 WARRANTIES

A. Weathertight warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 30 Years from date of Substantial Completion

B. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace standing seam metal roof panels that show evidence of deterioration of factory-applied finish within specified warranty period.

1. Exposed Panels Finish - deterioration includes the following:

- a. Color fading more than 5 hunter units when tested according to ASTM D 2244
- b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214
- c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.

2. Warranty Period: 20 Years from the date of substantial completion

C. Installer shall furnish written warranty for a two (2) year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight condition.

1.08 SUBMITTALS

A. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and types of sealants, and any other details as may be required for a weather-tight installation.

B. Provide finish samples of all colors specified.

C. Shop drawings: Show fabrication and installation layouts of metal roof panels, metal wall panels or metal soffit panels, details of edge conditions, side-seam joints, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work

D. Coordination Drawings: Roof plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installer of the items involved:

1. Roof panels and attachments
2. Metal trusses, bracings and supports
3. Roof-mounted items including snow guards and items mounted on roof curbs.

## SECTION 074100

### PREFORMED METAL STANDING SEAM ROOFING

#### 1.09 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instruction and lead time requirements to avoid construction delays.
- B. Deliver components, sheets, metal roof panels and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- C. Unload, store and erect metal roof panels in a manner to prevent bending, warping, twisting and surface damage.
- D. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting or other surface damage.
- E. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

#### 1.10 PROJECT CONDITIONS

- A. Weather Limitations: proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

#### 1.11 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim and construction of decks, parapet walls and other adjoining work to provide a leakproof, secure and noncorrosive installation.

### PART 2 - PRODUCTS

#### 2.01 PANEL DESIGN

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates and accessories required for a weathertight installation.
- B. Roof panels shall be 18" wide with a 1 1/2" high double-lock seam that is mechanically seamed in the field as produced by one of the following or an approved equal.
  - 1. Petersen Aluminum Corporation – Pac-150.
  - 2. Firestone Building Products – UC-14
  - 3. Englert Incorporated – A1500
- C. Panels to be produced with Factory supplied hot melt mastic in the seams.
- D. Panels to be produced Smooth - Factory Standard.
- E. Panels to be designed for attachment with concealed fastener clips, spaced as required by the manufacturer to provide for both positive and negative design loads, while allowing for the expansion and contraction of the entire roof system resulting from variations in temperature.
- F. Forming: Factory formed - continuous end rolling method.

#### 2.02 MATERIALS AND FINISHES

- A. Factory formed roofing panels shall be fabricated of .040 Aluminum
- B. Panel width – 18", 12" at chimney cricket

PROJ. NO. 16228E-03-01

074100-3

PREFORMED METAL STANDING SEAM ROOFING

## SECTION 074100

### PREFORMED METAL STANDING SEAM ROOFING

- C. Color shall be Dark Bronze
- D. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over a 0.25 to 0.3 mil prime coat to provide a total dry film thickness of 0.95 to 1.25 mil, to meet AAMA 621. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesions, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.
- E. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer or their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on shop drawings. Miter conditions shall be factory welded material to match the sheeting.
- F. Closures: use composition or metal profiled closures at the top of each elevation to close ends of the panels. Metal closures to be made in the same material and finish as face sheet.
- G. Clips – Manufacturer’s standard stainless-steel clips
- H. Fasteners: Fasteners shall be of pan head, bi-metal, 304 stainless. Designed for maximum pullout capacity in wood decking.
- I. Roofing Underlayment
  - 1. On all surfaces to be covered with roofing material, furnish and install a 40 mil Peel & Stick membrane, required as outlined by metal panel manufacturer. Membrane to be a minimum of 40 mil thickness, smooth, non-granular, high temperature. Material shall comply with metal panel manufacturer’s requirement for a 30-year weathertightness warranty.
- J. Sealants
  - 1. Exterior grade silicone sealant recommended by roofing manufacturer or
  - 2. One-part non-sag, gun grade exterior type polyurethane recommended by the roofing manufacturer.

#### 2.03 FABRICATION

- A. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer's standard product fabrication.
- B. Fabricate components of the system in factory, ready for field assembly.
- C. Fabricate components and assemble units to comply with fire performance requirements specified.
- D. Apply specified finishes in conformance with manufacturer's standard, and according to manufacturer's instructions.

#### PART 3 - EXECUTION

##### 3.01 INSPECTION

- A. Examine alignment of roof sheathing, prior to installation.
- B. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

##### 3.02 UNDERLAYMENT

- A. Underlayment shall be laid in horizontal layers with joints lapped toward the eaves a minimum of 6, and well secured along laps and at ends as necessary to properly hold the felt in place. All underlayment shall be preserved unbroken and whole.

## SECTION 074100

### PREFORMED METAL STANDING SEAM ROOFING

- B. Peel and Stick Underlayment shall lap all hips and ridges at least 12 to form double thickness and shall be lapped 6 over the metal of any valley or built-in gutters and shall be installed as required by the Standing Seam Panel Manufacturer to attain the desired 20 Year Weathertightness

#### 3.02 FASTENERS

- A. Place fasteners as indicated in manufacturer's standards.

#### 3.03 INSTALLATION

- A. Install the metal roof panel system in accordance with the manufacturer's instructions, installation drawings, and approved shop drawings, so that it is weathertight and allows for thermal movement.
- B. Locate space and fasten all clips in accordance with roof panel manufacturer's recommendations. For required fasteners, use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the sealing washers.
- C. Panels must be locked in the field by a mechanical seamer.
- D. Do not place utility penetrations through the panel seams.
- E. Do not allow panels or trim to come into contact with dissimilar materials (i.e. copper, lead, graphite, treated lumber, mortar, etc). Protect from water run-off from these materials.
- F. Perform field cutting of panels and related sheet metal components by means of hand or electric shears. At no time shall a hot/friction saw be used.
- G. Remove protective film immediately after installation.

#### 3.4 DAMAGED MATERIAL

- A. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

END OF SECTION 074100



SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including City of Philadelphia Standard Contract Requirements, amendments, and attachments; and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing.
  - a. Vapor barrier – SBS polymer modified bitumen self-adhered to plywood.
  - b. Base Ply – Polyester reinforced SBS ply, torch grade.
  - c. Cap Ply – Glass mat reinforced SBS, torch grade, fire rated with white granules.
- 2. Roof insulation and substrate boards.
- 3. Roofing sealants and flashings.
- 4. Pitch pockets.
- 5. Non-penetrating Support.

B. Related Sections:

- 1. Section 061053 "Rough Carpentry" for wood nailers and blocking.
- 2. Section 061600 "Sheathing" for replacement of deteriorated plywood sheathing.
- 3. Section 076200 "Sheet Metal Flashing and Trim" for underlayment, metal roof flashings and counter flashings.
- 4. Section 07 9200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 REFERENCES

- A. Reference Standards: References in these specifications to standards, test methods, codes etc., are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.

ASTM      American Society for Testing and Materials  
Philadelphia, PA (215) 299-5585

FM              Factory Mutual Engineering and Research  
Norwood, MA (617) 762-4300

IBC              International Code Council  
Country Club Hills, IL (800) 214-4321

PROJECT No. 16228E-03-01  
075216 -1

MODIFIED BUTUMINOUS MEMBRANE ROOFING

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

NRCA	National Roofing Contractors Association Rosemont, IL (708) 299-9070
OSHA	Occupational Safety and Health Administrations Washington, DC (202) 523-8036
SMACNA	Sheet Metal and Air Conditioning Contractors National Association Chantilly, VA (703) 803-2980
UEAtc	The European Union of Agrément, General Secretariat: British Board of Agrément, Bucknalls Lane, Garston, Watford, Herts WD25 9BA, UK
UL	Underwriters Laboratories Northbrook, IL (708) 272-8800

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall not wrinkle or split over time and shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7. Roof membrane manufacturer shall provide calculations and attachment requirements to meet code requirements for the following roof areas:
  - 1. Field of roof, Perimeter and corner uplift resistance shall be calculated to meet FM 1-90 criteria
- D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
  - 1. Fire/Windstorm Classification: Class 1A-90
  - 2. Hail Resistance Rating: MH

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

1.5 SUBMITTALS

Prior to starting work and before the preconstruction meeting, the following submittals shall have been submitted for review:

- A. Product Data:
  - 1. Product Data each type of product indicated.
  - 2. Manufacturer's written instructions for installation
  - 3. Product Data for applicable accessories.
  - 4. MSDS
- B. Temporary Protection: Plan diagram and narrative of procedures and schedules.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Base flashings and membrane terminations.
  - 2. Tapered insulation, including slopes.
  - 3. Crickets, saddles, and tapered edge strips, including slopes.
  - 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
  - 5. Manufacturer's standard details for the specific roofing system assembly
- D. Qualification Data: For qualified installer, manufacturer, and testing agency.
  - 1. Written confirmation from the roof membrane manufacturer stating:
    - a. Intent to warrant the roof system as specified in the contract documents
    - b. The Contractor is an Approved Applicator meeting Acceptable Roofing Applicator requirements of the contract documents and is eligible to install the specified roof system as necessary to quality for the specified Manufacturer's Warranty.
  - 2. List of three completed projects using the type roof membrane specified, or a specified equivalent. Include the following information for each project:
    - a. Project name
    - b. Project size and scope of work
    - c. Owner/client contact name and phone number
- E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
  - 1. Submit evidence of complying with performance requirements.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

- G. Research/Evaluation Reports: For components of membrane roofing system, from the currently ratified ICC-code as well as the Philadelphia code.
- H. Maintenance Data: For roofing system to include in maintenance manuals.
- I. Warranties: Samples of manufacturer and installer warranties.

1.6 SUBMITTALS FOR RECORD – After Completion of Work

- A. Certificate of Analysis: From the testing laboratory of the primary roofing materials manufacturer, confirming the physical and mechanical properties of the roofing membrane components. Testing shall be in accordance with the parameters published in ASTM D 5147 and UEAtc\* and indicate Quality Assurance/Quality Control data as required to meet the specified properties. A separate Certificate of Analysis for each production run of material shall indicate the following information:
  - 1. Material type
  - 2. Lot number
  - 3. Production date
  - 4. Dimensions and Mass (indicate the lowest values recorded during the production run)
    - a. Roll length
    - b. Roll width
    - c. Selvage width
    - d. Total thickness
    - e. Thickness at selvage
    - f. Weight
  - 5. Physical and Mechanical Properties
    - a. Low temperature flexibility
    - b. Breaking load
    - c. Ultimate elongation
    - d. Dimensional stability
    - e. Compound stability
    - f. Granule embedment
    - g. Resistance to thermal shock (foil faced products)
- B. Invoice slips for all materials.
- C. Maintenance Data: Complete maintenance manuals for all components of roofing system.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM approved for membrane roofing system identical to that used for this Project.

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product, is eligible to receive manufacturer's warranty, and has a minimum of three years of experience.
- C. Source Limitations: Obtain components including fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- D. Exterior Fire-Test Exposure: ASTM E 108, Class A for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- F. Preliminary Roofing Conference: Before starting demolition, conduct conference at MLK Recreation Center.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, roofing installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories, pipe insulation, protective coatings, etc.
    - a. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
    - b. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    - c. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
    - d. Review structural loading limitations of roof deck during and after roofing.
    - e. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
    - f. Review governing regulations and requirements for insurance and certificates if applicable.
    - g. Review temporary protection requirements for roofing system during and after installation.
    - h. Review roof observation and repair procedures after roofing installation.
    - i. Review material and personnel access limitations, storage locations (roof and on ground) and debris removal.
    - j. Review procedures for removal and replacement of existing pipe insulation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Handle and store insulation and other roofing materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends and placed over column points. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store materials such as solvents, adhesives and asphalt cutback products away from open flames, sparks or excessive heat. Cover all material using a breathable cover. Polyethylene or other non-breathable plastic coverings are not acceptable.
  - 1. Any damaged, wet, or frozen goods shall be removed from the site immediately at no charge to the Owner.
- D. Place equipment in a manner to avoid deflection of the structure.

1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Surfaces on which the installation or roofing membrane is to be applied shall be clean, smooth, dry, free of the possibility of frost, dew or contaminants that would prevent proper installation.
- C. Waste products (petroleum, grease, oil and solvents, vegetable or mineral oil and animal fat, or direct contact with steam venting) shall not be allowed to come in contact with the roof membrane system.
- D. Daily Seal: Roof shall be sealed to ensure that moisture does not penetrate beneath any completed sections of the roof by temporarily sealing the loose edge of the membrane at the end of each work day and prior to the arrival of inclement weather. The manufacturer's requirements shall be followed closely. Contractor shall inspect existing components for moisture intrusion along the tie-in after opening the daily seal on the next work day. All temporary and/or wet or damaged materials shall be removed prior to starting work.

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
  - 1. Warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, metal trim, and all components of membrane roofing system.

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

2. Warranty Period: 30 year NDL on all manufacturer's approved materials from date of Substantial Completion.
- B. Roofer's Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, and walkway products, for the following warranty period:
1. Warranty Period: Two years from date of Substantial Completion on all materials installed.

PART 2 - PRODUCTS

2.1 SBS-MODIFIED ASPHALT-SHEET MATERIALS

- A. SBS-Modified Bituminous Membrane Roofing using the torch down method for the base ply, cap sheet, and flashings
1. Manufacturers: Subject to compliance with requirements, provide products of the following manufacturers and their products listed below:
    - a. Soprema.
    - b. Johns Manville.

2.2 VAPOR BARRIER SHEET MATERIALS

- A. SBS Asphalt, woven polyethylene mat.
1. Johns Manville: Dynabase PR
  2. Soprema: Elastophene SP 2.2

2.3 BASE PLY MATERIALS

- A. ASTM D 6164, Grade S, Type I, SBS-modified asphalt sheet (reinforced with polyester); smooth surfaced; suitable for torch application.
1. Soprema: Sopralene Flam Stick
  2. Johns Manville: Dynaweld 180 S

2.4 CAP SHEET MATERIALS

- A. Granule-Surface Roofing Membrane Cap Sheet: ASTM D 6164, Grade G, Type I, SBS-modified asphalt sheet (reinforced with glass fibers); white granular surfaced; suitable for torch application.

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

1. Soprema: Sopralene FR GR
2. Johns Manville: Dynaweld Cap 180 FR CR G

2.5 FLASHING BASE PLY MATERIALS

- A. ASTM D 6163, Grade S, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); smooth surfaced; suitable for torch application.
  1. Soprema: Sopralene Flam 180
  2. Johns Manville: Dynaweld 180 S

2.6 FLASHING CAP PLY MATERIALS:

- A. Granule-Surface Roofing Membrane Cap Sheet: ASTM D 6164, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with polyester); white granular surfaced; suitable for torch application or- ASTM D 6163, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); white granular surfaced; suitable for torch application.
  1. Soprema: Sopralene FR GR
  2. Johns Manville: Dynaweld Cap 180 FR CR G

2.7 REINFORCED LIQUID APPLIED FLASHING.

- A. System shall include manufacturer's standard paste resin and repair mortar; reinforcement layer; flashing resin; and surfacing granules.
  1. Johns Manville: PermaFlash
  2. Soprema: Alsan

2.8 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
  1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
  2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Plastic Foam Adhesives: 50 g/L.
    - b. Gypsum Board and Panel Adhesives: 50 g/L.
    - c. Multipurpose Construction Adhesives: 70 g/L.
    - d. Fiberglass Adhesives: 80 g/L.



SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

- e. Contact Adhesive: 80 g/L.
  - f. Other Adhesives: 250 g/L.
  - g. Nonmembrane Roof Sealants: 300 g/L.
  - h. Sealant Primers for Nonporous Substrates: 250 g/L.
  - i. Sealant Primers for Porous Substrates: 775 g/L.
- B. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.
- C. Sealant: Single component moisture cured polyurethane sealant as part of the roofing manufacturers approved system.
- D. Substrate Primer: Liquid applied substrate conditioner.
- 1. Soprema: Elastocol 350
  - 2. Johns Manville: Asphalt Primer
- E. Cold Applied Adhesive: Solvent free, polymeric adhesive, non-toxic and low-odor, complying with all roofing membrane adhesive VOC regulations, and meeting the requirements of ASTM D7379.
- a. Soprema - Colply EF Adhesive
  - b. Johns Manville: MBR Cold Applied.
  - c. Firestone - LiquiGard
- F. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer. Fasteners shall be equal to the following
- 1. Anchor sheet – OMG OlyLok
- G. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 (2.36-mm) sieve and 98 percent of mass retained on No. 40 (0.425-mm) sieve, color to be white.
- H. Miscellaneous Accessories: Any and all pre-manufactured roof accessories such as pitch pockets and reinforced fluid applied waterproofing membrane to implement special conditions as noted in the drawings. Provide those recommended by roofing system manufacturer.
- 2.9 COVER BOARDS
- A. Cover Board: Board manufactured to serve as a substrate for the installation of torched SBS membrane and meeting the following criteria,
- 1. Thickness - 1/4 inch min.
  - 2. Compressive Strength – 900 psi
  - 3. Flexural Strength – 80 psi

PROJECT No. 16228E-03-01

075216 –9

MODIFIED BUTUMINOUS MEMBRANE ROOFING

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

4. Water Absorption - <5.5%

- B. Bead –Applied Insulation Adhesive: Adhesive shall be approved by the roofing manufacturer and match the quality, performance and odor of the adhesive listed.
  - 1. OlyBond 500

2.10 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, felt or glass-fiber mat facer on both major surfaces. Boards shall be no greater than 4 x 4 feet.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/2 inch per 12 inches unless otherwise indicated.
- D. Provide saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to a minimum ¼ inch final slope.

2.11 ROOF INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer. Fasteners shall be equal to the following.
  - 1. OMG CD-10 and plate at structural concrete
  - 2. TruFast 15 EHD and plate at metal deck
- C. Bead –Applied Insulation Adhesive: Adhesive shall be approved by the roofing manufacturer and match the quality, performance and odor of the adhesive listed.
  - 1. OlyBond 500
- D. Cant Strips: ASTM C 728, perlite insulation board, 1-1/2" x 4".
- E. Wood Nailer Strips: Comply with requirements in Division 06 Section "Miscellaneous Carpentry."
- F. Tapered Edge Strips: ASTM C 728, perlite insulation board.
  - 1. Finish: Post-fabrication, chemically bonded color (dark bronze or sim)

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

2.12 PITCH POCKETS

- A. General: Furnish pitch pocket accessories recommended by roofing manufacturer for intended use and compatibility with membrane roofing.
- B. Pourable Sealer: Manufacturer's standard low VOC, rubber, 1-part flexible, self leveling, moisture cure, pourable sealer. (1-Part)

2.13 ROOFTOP NON-PENETRATING SUPPORT ASSEMBLY

- A. Rooftop Non-penetrating Supports: Rubber block supports with galvanized continuous block channel support assemblies for the support of mechanical piping and electrical conduit.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dura-blok; DB Series.
    - b. G-Strut; #100 Series.
- B. Fasteners: Manufacturer's standard for attachment of mechanical piping and electrical conduit.
- C. Accessories: Provide manufacturer accessories and components required to anchor and secure mechanical piping and electrical conduit to comply with federal, state, and local code jurisdictions.
- D. Isolation Pad: Provide roofing manufacturer standard isolation pad beneath each non-penetrating roof support that is compatible with the specified roof assembly.

PART 3 - EXECUTION

3.1 GENERAL

- A. After completion and extinguishing all torches, contractor must provide a fire watch for a minimum of three (3) hours.
- B. All fuel products shall be removed from the immediate work area and transported off site as instructed by the DPP Project Coordinator.
- C. The Contractor is responsible for project safety. Where conditions are deemed unsafe to use open flames. Hot-air welding equipment may be used in lieu of roof torches to seal membrane side and end laps where heat welding the laps is necessary. Refer to NRCA CERTA, local codes and building owner's requirements for hot work operations.

## SECTION 075216

### MODIFIED BUTUMINOUS MEMBRANE ROOFING

#### 3.2 EXAMINATION

- A. Perform all preparatory work outlined in Section 07 0150, Preparation for Re-Roofing, and as shown on the contract drawings. Prior to installing roof, examine substrates, and other field conditions for compliance with the following requirements and other conditions affecting performance of roofing system:
  - 1. Verify that roof penetrations are securely in place and curbs are set and braced and that roof drain bodies are securely clamped in place and not broken or inoperable.
  - 2. Verify that existing lightweight concrete substrate is visibly dry and free of moisture.
  - 3. Verify that deck repair material has cured per manufacturer's requirements before installing base sheet.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.3 PREPARATION

- A. Review substrate for voids, deteriorated materials, and cracks. Remove all deficient substrate and fill with Insulation boards. Boards must be full sized. Multiple partial boards may not be installed. Areas less than 12 sf may be filled with lightweight concrete.
- B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- D. Preparation of existing substrates for liquid flashing installation:
  - 1. Aluminum Composite Panel substrate prep: Clean as per SSPC Surface Preparation Standard No. 15. Do not damage aluminum substrate.
  - 2. Steel substrate prep: Clean as per SSPC Surface Preparation Standard No 11. Do not permit stains to remain on surface.
  - 3. PVC substrate prep: Use 20 grit sandpaper to remove all EPDM glue residue and to roughen up surface. Do not use power tool.

#### 3.4 VAPOR BARRIER INSTALLATION

- A. Apply self-adhered underlayment over plywood substrate. See Section 076200 "Sheet Metal Flashings and Trim" for underlayment requirements.
- B. Begin by unrolling the membrane to its complete length. Once relaxed for a minimum of twenty minutes, reroll the membrane.

## SECTION 075216

### MODIFIED BUTUMINOUS MEMBRANE ROOFING

- C. Unroll membrane on substrate for alignment.
- D. Place membrane so edge lap will be centered on drain.
- E. Application shall provide a smooth surface, free of air pockets, wrinkles, fish mouths or tears.
- F. Install lapped course, extending over and terminating beyond cants. Attach as follows:
  - 1. Fully adhere by torching.
- G. Ensure manufacturer required side-laps and end-laps are maintained, or as indicated below.
  - 1. 6 in end-laps
  - 2. 3 in side laps
  - 3. End-laps should be staggered 3 ft apart.
- H. While unrolling and heating the sheet, ensure a constant flow hot bitumen approximately ¼ to 1/2 in flows ahead of the roll as it is unrolled, and there is 1/8 to 1/4 in bleed out at all laps.
- I. At the side, melt the plastic burn-off film from the top surface using a torch or hot-air welder.
- J. At end-laps, cut a 45 degree dog-ear away from the selvage edge. Ensure the membrane is fully heat-welded watertight at all T-joints.
- K. Each day, physically inspect all side and end-laps, and ensure the membrane is sealed watertight. Where necessary, use a torch or hot-air welder and a clean trowel to ensure all laps are sealed.
- L. Inspect the installation each day to ensure the plies are fully adhered. Repair all voids, wrinkles, open laps and all other deficiencies.

### 3.5 INSULATION INSTALLATION

- A. Install insulation where shown on drawings or where required by the Project Manual.
- B. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- C. Install insulation in a minimum of two layers with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Offset joints between layers a minimum of 12 inches. Fill gaps exceeding 1/4 inch with insulation. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- D. Install sumps at the drains with a ½" : 1' slope.
- E. Install tapered edge strips at perimeter edges of roof and at raised curbs that do not terminate at vertical surfaces.
- F. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints a minimum of 6 IN in each direction from joints of

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

insulation below. Loosely butt cover boards together and fasten to roof deck together with the insulation if approved by roof membrane manufacturer.

- G. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes more than 45 degrees.
- H. Adhesive Installation - Apply ½” wide beads. Allow adhesive to rise to ¾“-1”. Set the insulation boards after foam rises but prior to adhesive skinning over. Immediately after positioning the insulation, weight each board. Position weights so they are centered over the corners of the insulation boards. Weight shall be left in place for about 5- 15 minutes.

3.6 WOOD BLOCKING

- A. Install nailers, of minimum one-inch thickness and minimum three inches width. The maximum unsupported overhang for all applications shall not exceed two inches.
- B. Nailers shall be firmly anchored to the deck using fastener devices and spacing in compliance the roofing manufacturer and SMACNA. Anchors shall be spaced to provide a design value of not less than 250 lbf/ft for perimeters and 300 lbf/ft at corners after application of the appropriate margin of safety.
- C. Height of nailers shall match the height of the adjacent surface level or a tapered edge shall be installed to bridge the varying heights.
- D. If the compressive strength of the concrete deck is less than 2,500 psi (17,000 kPa) or the concrete thickness is less than 2-1/2 inches (64 mm), an on-site test shall be carried out to confirm anchor performance.
- E. Attachment of wood blocking to standard masonry block, the top two courses shall be filled with ASTM C 270 mortar and allowed to cure for 28 days.

3.7 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
- B. Contractor shall perform all testing and other examination of deck surface as recommended by the roofing materials manufacturer and as recommended by manufacturer of the roof deck materials. Responsibility for determination of moisture content of deck being suitable for application of roofing materials shall be the sole responsibility of the Contractor.
- C. Prime all dissimilar surfaces to which asphalt or membrane shall come in contact. Apply at the rate of 100 to 150 sf per gallon. Coat with primer all metal flashings and fascia that come in contact with membrane.

## SECTION 075216

### MODIFIED BUTUMINOUS MEMBRANE ROOFING

- D. Apply general purpose SBS mastic and roofing cement to seal drain leads, metal flanges, seal along membrane edge at terminations, and where specified.
- E. Do not use general purpose SBS mastics and roofing cement where flashing cement applications are required. Do not use SBS mastics and roofing cement beneath SBS-modified bitumen membrane and flashing plies.
- F. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- G. Cooperate with testing agencies engaged or required to perform services for installing roofing system.
- H. Should conditions be uncovered or created which would be detrimental to the proper conduct of specified work, immediately notify the Owner Representative of these conditions for resolution.
- I. Begin installation of the roof membrane system at the low point of the roof and proceed upslope. Install membrane plies shingle style, perpendicular to the slope.
- J. Extend roofing membrane and flashings as shown to provide complete membrane over area(s) indicated to be roofed. Seal to all equipment projections through membrane and seal all membrane and flashing seams. Ensure complete bonding to vertical surfaces and, where shown or recommended by material manufacturer, to horizontal surfaces.
- K. Coordinate installation of roofing system so insulation and other components of the roofing membrane system which are not to be permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
  - 1. At end of each day's work, provide tie-offs to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
  - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
  - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

#### 3.8 BASE SHEET INSTALLATION

- A. Begin by unrolling the membrane to its complete length. Once relaxed for a minimum of twenty minutes, reroll the membrane.
- B. Unroll membrane on substrate for alignment.
- C. Place membrane so edge lap will be centered on drain.
- D. Application shall provide a smooth surface, free of air pockets, wrinkles, fish mouths or tears.
- E. Install lapped course, extending over and terminating beyond cants. Attach as follows:
  - 1. Fully adhere by torching.

PROJECT No. 16228E-03-01  
075216 -15

MODIFIED BUTUMINOUS MEMBRANE ROOFING

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

- F. Ensure manufacturer required side-laps and end-laps are maintained, or as indicated below.
  - 1. 6 in end-laps
  - 2. 3 in side laps
  - 3. End-laps should be staggered 3 ft apart.
- G. While unrolling and heating the sheet, ensure a constant flow hot bitumen approximately ¼ to 1/2 in flows ahead of the roll as it is unrolled, and there is 1/8 to 1/4 in bleed out at all laps.
- H. At the, melt the plastic burn-off film from the top surface or embed granules, where present, using a torch or hot-air welder.
- I. At end-laps, cut a 45 degree dog-ear away from the selvage edge. Ensure the membrane is fully heat-welded watertight at all T-joints.
- J. Each day, physically inspect all side and end-laps, and ensure the membrane is sealed watertight. Where necessary, use a torch or hot-air welder and a clean trowel to ensure all laps are sealed.
- K. Inspect the installation each day to ensure the plies are fully adhered. Repair all voids, wrinkles, open laps and all other deficiencies.

3.9 CAP SHEET INSTALLATION

- A. Construct and stage the project so that PHASED APPLICATION can be achieved. Phased application maintains a watertight condition with the base ply and reinforcing plies to vertical surfaces without the installation of the cap sheet. The base ply may stay exposed per the manufacturer's requirements and recommendations. When roof top equipment and trades have finished, the application of the cap sheet installation may begin only after the manufacturer has conducted an inspection of the base sheet and provided a written report verifying examination of the base sheet. The contractor must schedule this inspection and notify the Architect five (5) days in advance.
- B. Apply cap sheet in accordance with roofing system manufacturer's instruction and the following requirements.
- C. Prime metal flanges (all jacks, edge metal, lead drain flashings, etc.) and concrete and masonry surfaces with a uniform coating of ASTM D 41-85 asphalt primer.
  - 1. Cutting or alterations of bitumen, primer, and sealants will not be permitted.
- D. Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets. Stagger the lap seams between the base ply layer and the finish ply layer.
- E. Begin by unrolling the base membrane to its complete length. Once relaxed for a minimum of twenty minutes, reroll the field membrane ply each end, one end at a time to insure proper alignment.



## SECTION 075216

### MODIFIED BUTUMINOUS MEMBRANE ROOFING

- F. Install the cap sheet membrane starting at the low point of the roof area. The membrane shall be installed parallel to the base ply. Keep end laps away from locations where the positive flow of water to drains will be inhibited.
- G. Fully bond the finish ply to the base ply. Maintain manufacturers required laps or as indicated below.
  - 1. 6 in end-laps
  - 2. 3 in side laps
  - 3. End-laps should be staggered 3 ft apart.
  - 4. Stagger Cap ply laps 3 ft from base ply laps
- H. Asphalt bleedout must be present and continuous at all seams. A minimum 1/4 inch flow-out must be obtained at all seam areas. A maximum 3/4 inch flow-out must not be exceeded.
- I. To ensure the proper flow of bitumen at the seam areas, a weighted roller or broom may be used. The roller operator should follow behind the torch no more than 4 ft nor less than 3 ft to be sure that the membrane will be in condition to produce proper flow.
- J. Check all seams for full and uniform adhesion. All unadhered seams shall be lifted and resealed. Press or roll seam to achieve a minimum 3/8 inch compound flow-out of bitumen.
- K. If end laps fall in line, a full width of membrane must be installed over the end laps.
- L. Treatment of Bleed-Out: Broadcast ceramic granules of the same color as the membrane into the bleed-out of asphalt at all side and end laps to provide a continuous appearance.
- M. Broadcast mineral granules over all bitumen overruns on the finish ply surface, while the bitumen is still hot, to ensure a monolithic surface color.

#### 3.10 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:
  - 1. Prime substrates as per written requirements of roofing system manufacturer.
  - 2. Base Ply Application at insulation and plywood curbs: Nail top of base sheet to the top of curb following the manufacturer's recommendations.
  - 3. Base Ply Application at concrete and cover board: Torch adhere flashing sheet to substrate at rate required by roofing system manufacturer.
  - 4. Flashing Cap Sheet Application: Torch adhere flashing sheet to substrate at rate required by roofing system manufacturer.
  - 5. At skylight curbs and other locations as directed by the architect, install the base flashing with Cold Applied Adhesive.

PROJECT No. 16228E-03-01  
075216 -17

MODIFIED BUTUMINOUS MEMBRANE ROOFING

## SECTION 075216

### MODIFIED BUTUMINOUS MEMBRANE ROOFING

- B. Extend base ply flashing up walls a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane. Extend base ply flashing at parapets over top surface and down two inches past wood blocking
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
  - 1. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement].
- D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.
- E. Roof Drains: Set 30-by-30-inch square metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
  - 1. Install stripping according to roofing system manufacturer's written instructions.

#### 3.11 LIQUID FLASHING INSTALLATION

- A. Prepare substrate as per liquid flashing manufacturer's written recommendations.
- B. Apply manufacturer's standard paste and repair depressions in substrate material as per manufacturer's recommendations. Apply in thicknesses as per manufacturer's written recommendations.
- C. Apply manufacturer's standard reinforcement fabric.
- D. Apply manufacturer's standard flashing resin. Apply summer grade flashing resin when ambient temperature is between 59 and 122 degrees F. Apply winter grade flashing resin when ambient temperature is between 25 and 68 degrees F.
- E. Maintain manufacturer's written requirements for overlap and coverage.
- F. Apply manufacturer's standard surfacing granules and/or color finish where indicated on the drawings.

#### 3.12 PITCH POCKET INSTALLATION

- A. Remove existing pitch pockets and clean all penetrations down to base metal. Follow SSPC Surface Preparation Standard No. 11 to provide a roughened, clean, bare metal surface free of all visible oil, grease, dirt, rust, coating, oxides, mill scale, corrosion products and other foreign matter. Do not permit stains to remain on surface.

## SECTION 075216

### MODIFIED BUTUMINOUS MEMBRANE ROOFING

- B. Prime and install new pitch pocket as per manufacturer's written instructions and to satisfy all requirements for warranty.

#### 3.13 ROOF ACCESSORIES/ NON-PENETRATING SUPPORT INSTALLATION

- A. General: Install roof-top non-penetrating support according to manufacturer's written instructions.
  - 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
  - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
  - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
  - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

#### 3.14 ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS

- A. The following is a list of descriptions for correct installation of components integrated into the roof membrane assembly. In all cases, unless otherwise approved, incorporate flanged components into the system between the application of the base ply and the finish ply. The flange must be primed with a uniform coating of approved ASTM D 41-85 asphalt primer and allowed to dry thoroughly; all flanges must be set in approved mastic.
  - 1. Concrete parapet walls: Prime and torch adhere a base ply extend a minimum of three (3) inches onto the base ply of the field. After the field cap ply has been applied to the top of the cant, prepare the surface area that is to receive flashing cap sheet coverage by application of asphalt primer; allowing primer to dry thoroughly. Torch apply flashing cap sheet into place using three foot widths (cut off the end of roll) always lapping the factory selvage edge. Extend the flashing cap sheet a minimum of four (4) inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the desired flashing height. Exert pressure on the flashing cap sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets. Check and seal all loose laps and edges. Extend the roofing over the parapet and terminate.
  - 2. Curbs: Cover insulation, wood, and metal curbs with ½ inch Gypsum sheathing mechanically fastened into place. Install flashing as described for the parapet walls.
  - 3. Edge Metal: Completely prime metal flanges and allow to dry prior to installation. Turn the base ply down two (2) inches past the roof edge and over the nailer. After the base ply and continuous cleat (if applicable) have been installed, set the flange in mastic and stagger nail every three (3) inches on center or as recommend by the metal manufacturer. Strip-in the flange using the stripping-ply material, extending a minimum of four (4) inches beyond the edge of the flange. Terminate the cap ply at the gravel-stop rise of the edge metal.
  - 4. Lead drain flashings. The roof drain sump shall be clean and free of all rust and dirt before installing the flashing. Completely prime the lead drain flashing and allow to dry prior to installation. After the base ply has been applied, set the lead flashing sheet in

## SECTION 075216

### MODIFIED BUTUMINOUS MEMBRANE ROOFING

mastic and form to turn down inside of the drain bowl. Ply-in the perimeter of the lead flashing using an additional layer of the base ply material, overlapping the perimeter of the lead a minimum of four (4) inches. Terminate the cap ply to extend beneath the clamping ring seal. Install the clamping ring with all clamps, bolts etc., in place.

5. Metal pipe: Reinforced, fluid applied flashing material is to be used for all post supports and low flashing lights. Reinforced, fluid applied material may also be used as base flashing for walls behind hard to flash objects. Follow manufacturers' recommended application guidelines. The metal is to be thoroughly cleaned of existing roofing materials by wire brushing and/or grinding before installation of the liquid flashing system.
6. Sealant. Caulk all exposed finish ply edges at gravel stops, waste stacks, pitch pans, vent stacks, etc, with a smooth continuous bead of approved sealant.

#### 3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform test and inspections and to prepare test reports.
- B. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:
  1. Approximate quantities of components within roofing membrane will be determined according to ASTM D 3617.
  2. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
  3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.
- C. Roofing system will be considered defective if it does not pass tests and inspections.
  1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

#### 3.16 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. Remaining construction cannot pass over completed roof areas.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

3.17 FINAL INSPECTION

- A. Contractor shall advise the Architect in writing that the work is substantially completed and include a list of outstanding items for completion. Architect shall examine the work and advise if the work is substantially complete along with any incomplete or incorrect issues to be completed or corrected.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- D. Drain Verification: Drains shall be inspected by a certified plumbing a warranted to be free flowing. Ensure that roof drains strainers are properly installed,
- E. Air Handling Units. Reconnect all ductwork, electrical and supply connection. At final inspection, verify that all connections are restored to a complete working, watertight, and safe condition, following SMACNA standards.

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

ROOFING INSTALLER'S WARRANTY

- F. WHEREAS **<Insert name>** of **<Insert address>**, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: **<Insert name of Owner>**.
  2. Address: **<Insert address>**.
  3. Building Name/Type: **<Insert information>**.
  4. Address: **<Insert address>**.
  5. Area of Work: **<Insert information>**.
  6. Acceptance Date: **<Insert date>**.
  7. Warranty Period: **<Insert time>**.
  8. Expiration Date: **<Insert date>**.
- G. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- H. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- I. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    - a. lightning;
    - b. peak gust wind speed exceeding **<Insert wind speed>** mph;
    - c. fire;
    - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    - f. vapor condensation on bottom of roofing; and
    - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
  2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

SECTION 075216

MODIFIED BUTUMINOUS MEMBRANE ROOFING

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

J. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.

1. Authorized Signature: **<Insert signature>**.
2. Name: **<Insert name>**.
3. Title: **<Insert title>**.

END OF SECTION 07 5216

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof sheet metal flashings, roof edge fascia and drip edges.
2. Sheet metal flashings at wall openings.
3. Equipment support flashings.
4. Downspouts and conductor heads.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 074113 "Standing Seam Metal Roof Panels" for materials and installation of manufactured sheet metal flashings and trims integral with roofing.
3. Section 077100 "Roof Specialties" for manufactured roof-edge flashing at gutters.

1.2 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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

1.4 FIELD CONDITIOND AND DIMENSIONS

- A. Prior to ordering materials, or doing any work, verify at the site all dimensions, details, and conditions that may affect the work. No allowance for additional compensation will be considered for discrepancies between dimensions indicated in the specifications and drawings and actual field dimensions, or for the Contractor's failure to comply with this requirement.



SECTION 076200

SHEET METAL FLASHING AND TRIM

1.5 CONFLICT

- A. Immediately refer any conflicts among requirements of these specifications and drawings, those of regulatory agencies, and those of roof system / materials manufacturer's recommendations and good roofing and masonry practices to the Owner for resolution.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
  - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
  - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
  - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - 6. Include details of termination points and assemblies.
  - 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
  - 8. Include details of roof-penetration flashing.
  - 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
  - 10. Include details of special conditions.
  - 11. Include details of connections to adjoining work.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
  - 1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop is to be listed as able to fabricate required details as tested and approved.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

## SECTION 076200

### SHEET METAL FLASHING AND TRIM

1. Build mockup of typical roof edge for each type of roof assembly, including built-in gutter, approximately 6 feet long, including supporting construction cleats, seams, attachments and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
  1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
  2. Protect stored sheet metal flashing and trim from contact with water.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
  1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

SECTION 076200

SHEET METAL FLASHING AND TRIM

2.2 SHEET METAL FLASHINGS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Source Limitations: Obtain sheet metal flashings from single source from single manufacturer.
- C. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
  - 1. Exposed Coil-Coated Finish:
    - a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 2. Color: As selected by Architect from manufacturer's full range.
  - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- D. Stainless Steel Sheet: ASTM A240/A240M, Type 316, dead soft, fully annealed; with smooth, flat surface.
  - 1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled)
- E. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.
  - 1. Exposed Coil-Coated Finish:
    - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 2. Color: As selected by Architect from manufacturer's full range.
  - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high

## SECTION 076200

### SHEET METAL FLASHING AND TRIM

metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Soprema, Sopralene Stick or comparable product by one of the following:
  - a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
  - b. Polyglass USA, Inc.
2. Source Limitations: Obtain underlayment from single source from single manufacturer.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
    - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  2. Fasteners for Aluminum Sheet: Series 300 stainless steel.
  3. Fasteners for Stainless Steel Downspouts: Series 300 stainless steel.
  4. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.
- C. Solder:
  1. For Stainless Steel: ASTM B32, Grade Sn 60 or Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

## SECTION 076200

### SHEET METAL FLASHING AND TRIM

- E. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

#### 2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
  - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
  - 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
  - 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
  - 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

## SECTION 076200

### SHEET METAL FLASHING AND TRIM

#### G. Seams:

1. Seams being soldered:
  - a. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  - b. Remove all flux residue. Comply with manufacturer's recommendations for neutralization.
  - c. Shop fabricate all soldered seams. Color finish to be applied after fabrication.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

#### H. Do not use graphite pencils to mark metal surfaces.

### 2.6 DOWNPOUT FABRICATIONS

- A. Downspouts: Fabricate rectangular and round downspouts to dimensions indicated, complete with mitered elbows and formed transitions. Shop fabricate elbows, transitions. Furnish metal hangers from same material, and same finish as downspouts and conductor heads. Provide seals at juncture between downspouts and existing cast-iron service bells at sewer connection. Hangers to hold downspouts securely to wall, top, bottom and at approximately 60 inch oc. Show hangers on shop drawings.
- B. Stainless-Steel Downspouts and Conductor Heads: ASTM A 240, Type 316, dead soft, fully annealed; with smooth, flat surface
  1. Alt/Credit: Finish 2D (dull, cold rolled)
  2. Finish: Post-fabrication, chemically bonded color (dark bronze or sim)
  3. Thickness: 0.0625 inch
- C. Downspout Hangers:
  1. Manufactured Hanger Style: in accordance with SMACNA's "Architectural Sheet Metal Manual."
  2. Hanger Style: As selected by Architect for manufacturer's full range.
  3. Fabricate from the following materials:
    - a. Stainless Steel: 0.0625 inch thick.
  4. Finish: Post-fabrication, chemically bonded color (dark bronze or sim)

### 2.7 ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Base Flashing: Fabricate from the following materials:
  1. Aluminum: 0.032 inch thick.
- B. Drip Edges: Fabricate from the following materials:
  1. Aluminum: 0.040 inch thick.
- C. Eave, Gable Rake, Ridge, and Hip Flashing: Fabricate from the following materials:
  1. Aluminum: 0.032 inch thick.

SECTION 076200

SHEET METAL FLASHING AND TRIM

- D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
  - 1. Aluminum: 0.032 inch thick.
- E. Slip flashing: Fabricate from the following materials:
  - 1. Aluminum: 0.032 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Masonry Construction: Fabricate head, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
  - 1. Stainless Steel: 0.0156 inch thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Continuous Cleat: Fabricate from the following:
  - 1. ASTM A 526 hot-dipped zinc-coated 22-gauge sheet steel, commercial quality; coating designation G 90, phosphatized, not chemically treated, not oiled; gauges as follows:
    - a. Thickness – 22 gauge minimum.
- B. Equipment Support Flashing: Fabricate from the following materials:
  - 1. Stainless Steel: 0.0188 inch thick.
  - 2. Galvanized Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
  - 1. Verify compliance with requirements for installation tolerances of substrates.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## SECTION 076200

### SHEET METAL FLASHING AND TRIM

#### 3.2 INSTALLATION OF UNDERLAYMENT

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
  - 1. Install in shingle fashion to shed water.
  - 2. Lap joints not less than 2 inches.
- B. Self-Adhering, High-Temperature Sheet Underlayment:
  - 1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
  - 2. Prime substrate if recommended by underlayment manufacturer.
  - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
  - 4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
  - 5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
  - 6. Roll laps and edges with roller.
  - 7. Cover underlayment within 14 days.

#### 3.3 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
  - 1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder or sealant.
  - 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
  - 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
  - 6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  - 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
  - 8. Do not field cut sheet metal flashing and trim by torch.
  - 9. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.



SECTION 076200

SHEET METAL FLASHING AND TRIM

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of [**10 feet**] <Insert dimension> with no joints within 24 inches of corner or intersection.
  2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
    - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
    - b. Form joints to completely conceal sealant.
    - c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
    - d. Adjust setting proportionately for installation at higher ambient temperatures.
      - 1) Do not install sealant-type joints at temperatures below 40 deg F.
  2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
  2. Stainless Steel Soldering:
    - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
    - b. Promptly remove acid-flux residue from metal after tinning and soldering.
    - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

## SECTION 076200

### SHEET METAL FLASHING AND TRIM

#### 3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Downspouts:
  - 1. Join sections with 1-1/2-inch telescoping joints.
  - 2. Provide hangers with fasteners designed to hold downspouts securely to walls.
  - 3. Locate hangers at top and bottom and at approximately 60 inches o.c.
  - 4. Connect downspouts to underground drainage system.
- C. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim as indicated on Drawings.
- D. Expansion-Joint Covers: Lap joints minimum of 4 inches in direction of water flow.

#### 3.5 INSTALLATION OF ROOF FLASHINGS

- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
  - 1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
  - 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing:
  - 1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
  - 2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
  - 3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
  - 1. Insert counterflashing in reglets and fit tightly to base flashing.
  - 2. Extend counterflashing 4 inches over base flashing.
  - 3. Lap counterflashing joints minimum of 4 inches.
  - 4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

## SECTION 076200

### SHEET METAL FLASHING AND TRIM

#### 3.6 INSTALLATION OF WALL FLASHINGS

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Masonry Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

#### 3.7 INSTALLATION OF MISCELLANEOUS FLASHING

- A. Equipment Support Flashing:
  - 1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
  - 2. Weld or seal flashing with elastomeric sealant to equipment support member.

#### 3.8 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

#### 3.9 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

#### 3.10 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.
- C. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

SECTION 076200

SHEET METAL FLASHING AND TRIM

END OF SECTION 076200

PROJECT No. 16228E-03-01  
076200 -13

SHEET METAL FLASHING AND TRIM

SECTION 077100

MANUFACTURED ROOF EDGE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including City of Philadelphia Standard Contract Requirements, amendments, and attachments; and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Gutter Edge Flashing.

- B. Related Sections:

- 1. Section 07 5216 "Modified Bituminous Membrane Roofing"
- 2. Section 07 6200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
- 3. Section 07 9200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. FM Approvals' Listing: Manufacture and install systems that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.
- C. SPRI Wind Design Standard: Manufacture and install systems tested according to SPRI ES-1 and capable of resisting the following design pressures:
  - 1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

## SECTION 077100

### MANUFACTURED ROOF EDGE SYSTEM

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
  - 1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
  - 2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
  - 3. Details of termination points and assemblies, including fixed points.
- C. Samples: For each type of roof edge condition indicated with factory-applied color finishes.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each system.
- B. Warranty: Sample of warranty.

#### 1.6 QUALITY ASSURANCE

- A. Each system shall be certified by the manufacturer to meet performance design criteria according to the following test standards:
  - 1. ANSI/SPRI ES-1 Test RE-3 for Coping: The coping system shall be tested simultaneously on horizontal and vertical surfaces and shall exceed horizontal and vertical design wind pressure as calculated in accord with the ANSI/SPRI ES-1 Test RE-3. Use the current edition of ANSI/SPRI ES-1 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
    - a. Wind speed: As indicated on Drawings.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

SECTION 077100

MANUFACTURED ROOF EDGE SYSTEM

1.8 WARRANTY

- A. Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

- A. Aluminum Sheet: Alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
  - 1. Surface: smooth flat finish.
  - 2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - a. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
    - b. Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and structural performance indicated.
- B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

## SECTION 077100

### MANUFACTURED ROOF EDGE SYSTEM

- B. Fasteners: Formed Aluminum Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
1. Fasteners for Aluminum or Stainless to wood: Series 300 stainless steel screws.
  2. Fasteners for Galvanized to wood: ASTM A 153 hot dip galvanized nails.
  3. Fasteners for Galvanized to concrete: Blue Climaseal Tapcon.
  4. Fastener Sizes: Use fasteners of sizes that will penetrate wood blocking not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws and not less than 1 inch for concrete screws.
- C. Elastomeric Sealant: A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT
- D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

#### 2.4 ROOF EDGE SYSTEM

- A. Manufactured system consisting of formed-metal cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps. Custom fabricate shapes as required to conform to existing conditions and create a continuous flange. Weld corners and special angles
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. Hickman Company, W. P.
    - b. American Architectural Metals.
    - c. Metal-Era, Inc.
  2. Cap Metal: Formed aluminum.
    - a. Finish: Two-coat fluoropolymer.
    - b. Color: As selected by Architect from manufacturer's full range.
  3. Splice Metal: Formed aluminum, .050 inch thick.
    - a. Finish: Two-coat fluoropolymer.
    - b. Color: Matching cap metal.
  4. Corners: Factory mitered and continuously welded.
  5. Ends: Close all exposed ends with welded caps.
  6. Intersection: Slope to create a smooth transition and fabricate a welded "T" to joint perpendicular metal sections.
  7. Cap Attachment Method: Snap-on.
  8. Anchor Plates: Concealed, galvanized-steel sheet 24 ga., with integral cleats.



## SECTION 077100

### MANUFACTURED ROOF EDGE SYSTEM

#### 2.5 GUTTER-EDGE FLASHING

- A. Gutter-Edge Fascia: Manufactured, two-piece, gutter-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed anchor bar with integral drip-edge cleat to engage fascia cover.

#### 2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION, GENERAL

- A. General: Install roof edge system according to manufacturer's written instructions. Anchor securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof edge systems.
  - 1. Install roof edge system level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
  - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
  - 3. Install to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
  - 4. Torch cutting of is not permitted.

## SECTION 077100

### MANUFACTURED ROOF EDGE SYSTEM

- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
  - 1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment.
  - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
  - 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
  - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Seal metal joints with two beads of butyl sealant to the splice plate each side of joint, unless other provisions are made by the manufacturer.
- E. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

### 3.3 GUTTER-EDGE FLASHING INSTALLATION

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor gutter edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

### 3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

PROJ. NO. 16228E-03-01  
077100-6

MANUFACTURED ROOF EDGE SYSTEM

SECTION 078413

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

- 1. Penetrations in fire-resistance-rated walls.
- 2. Penetrations in horizontal assemblies.

B. Related Requirements:

- 1. Section 07842 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.03 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.

1.04 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.05 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

SECTION 078413

PENETRATION FIRESTOPPING

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.08 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.01 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."

2.02 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.

SECTION 078413

PENETRATION FIRESTOPPING

1. Basis-of-Design Product: Subject to compliance with requirements, provide Fire Barrier Silicone Sealant 2000+; FIP 1-Step Fire Barrier Rated Foam; Fire Barrier Pillow as manufactured by 3M Fire Protection Products or approved equal.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
  2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- 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.

2.03 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

SECTION 078413

PENETRATION FIRESTOPPING

- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.04 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.

SECTION 078413

PENETRATION FIRESTOPPING

- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.03 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.

3.04 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.

3.05 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.
- 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.

SECTION 078413

PENETRATION FIRESTOPPING

- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.06 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413



SECTION 079200

JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Butyl sealants
4. Preformed Silicone sealants

B. Related Sections:

1. Section 04 0120 "Masonry Repairs" for repair work associated with masonry control and expansion joints.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

SECTION 079200

JOINT SEALANTS

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

E. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Owner shall arrange to Test joint sealants using a qualified testing agency.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.

SECTION 079200

JOINT SEALANTS

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. **Installer's Warranty:** Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. **Warranty Period:** Two years from date of Substantial Completion.
- B. **Manufacturer's Warranty:** Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. **Warranty Period:** 10 years from date of Substantial Completion.
- C. Warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  2. Disintegration of joint substrates from natural causes exceeding design specifications.
  3. Mechanical damage caused by individuals, tools, or other outside agents.
  4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. **Stain-Test-Response Characteristics:** Sealants shall be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. **Colors of Exposed Joint Sealants:** As selected by Architect from manufacturer's full range.

SECTION 079200

JOINT SEALANTS

2.2 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
    - a. Dow Corning Corporation; 795.
    - b. Pecora Corporation; 895.
    - c. Sika Corporation, Construction Products Division; SikaSil-C995.

2.3 URETHANE JOINT SEALANTS

- A. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
    - a. Pecora Corporation; Dynatrol II.
    - b. Polymeric Systems, Inc.; PSI-270.
    - c. Tremco Incorporated; Dymeric 240.

2.4 BUTYL-RUBBER-BASED JOINT SEALANT:

- A. Single component, Butyl Rubber based Sealant, ASTM C 1311.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
    - a. Pecora Corporation; BC-158.
    - b. Tremco Incorporated; Tremco Butyl Sealant.
    - c. Bostik, Inc.; Chem-Calk 300.

2.5 PREFORMED JOINT SEALANTS

- A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
    - a. Dow Corning Corporation; 123 Silicone Seal.
    - b. Pecora Corporation; Sil-Span.

## SECTION 079200

### JOINT SEALANTS

- B. **Preformed Foam Joint Sealant:** Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
    - a. EMSEAL Joint Systems, Ltd.; Emseal 25V.
    - b. Sandell Manufacturing Co., Inc.; Polyseal.
    - c. Willseal USA, LLC; Willseal 150.

#### 2.6 JOINT SEALANT BACKING

- A. **General:** Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. **Cylindrical Sealant Backings:** ASTM C 1330, Type B (bicellular material with a surface skin, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. **Bond-Breaker Tape:** Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

#### 2.7 MISCELLANEOUS MATERIALS

- A. **Primer:** Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. **Cleaners for Nonporous Surfaces:** Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. **Masking Tape:** Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

SECTION 079200

JOINT SEALANTS

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
  - 3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime all joint substrates where existing sealant has been removed and to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

## SECTION 079200

### JOINT SEALANTS

- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
  - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
  - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
  - 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
  - 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

### 3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

## SECTION 079200

### JOINT SEALANTS

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 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
  - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
  - a. Whether sealants filled joint cavities and are free of voids.
  - b. Whether sealant dimensions and configurations comply with specified requirements.
  - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.



SECTION 079200

JOINT SEALANTS

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Construction joints in cast-in-place concrete.
    - b. Joints between plant-precast architectural concrete units.
    - c. Control and expansion joints in unit masonry.
    - d. Joints in dimension stone cladding and copings.
    - e. Joints between metal panels.
    - f. Joints between different materials listed above.
  - 2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 50
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Urethane Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Minor joints not in contact with a sealant joint.
  - 2. Urethane Joint Sealant: Multicomponent, nonsag,, Class 50
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Butyl Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces
  - 1. Joint Locations:
    - a. Concealed metal to metal joints, in compression.
  - 2. Single component, Butyl Rubber based Sealant, ASTM C 1311
- D. Acoustical Sealant
  - 1. Joint Locations. Interior wall to ceiling joints.
- E. Preformed Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. As indicated on drawings
  - 2. Preformed Joint Sealant: Preformed silicone
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

SECTION 079200

JOINT SEALANTS

END OF SECTION 079200

PROJ. NO. 16228E-03-01

079200-10

JOINT SEALANTS

## SECTION 081113

### CUSTOM HOLLOW METAL DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

###### A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

###### B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
3. Division 08 Section "Door Hardware".
4. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

###### C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.

10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

### 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Qualification Data: Manufacturer and installer.
- C. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- D. Shop Drawings: Include the following:
  1. Elevations of each door design.
  2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of anchorages, joints, field splices, and connections.
  6. Details of accessories.
  7. Details of moldings, removable stops, and glazing.
  8. Details of conduit and preparations for power, signal, and control systems.
- E. Coordination Drawings: Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware, and preparations for power and electrified control systems.

F. Construction Samples:

1. Door: 12-inch by 12-inch corner section with hinge preparation showing top and internal construction.
2. Frame: 12-inch by 12-inch corner section showing welded joint of head to jamb. Include hinge, mortise, reinforcement and grout guard in one rabbet and glazing stop applied as specified in the opposite rabbet. Glazing stop must be applied to both head and jamb section to show corner joint.
3. All samples submitted shall be of the production type and shall represent in all respects the minimum quality of the Work to be furnished by the manufacturer. No Work represented by the samples shall be fabricated until the samples are approved; any downgrading of quality demonstrated by comparison with the samples may be cause for rejection of the Work.

G. Other Action Submittals

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 TESTING AND PERFORMANCE

A. Performance Test for Steel Doors and Hardware Reinforcements (ANSI A151.1).

B. Test specimen shall be at least a 3' x 7' (nominal size), 1-3/4"-thick steel door.

1. Test specimen door in accordance with ANSI A151.1 for Level "A" doors (1,000,000 cycles).
2. Test specimen door in accordance with ANSI A151.1 for twist test: maximum test pressure 300 lbs.

C. All test reports shall include a description of the test specimen, procedures used in testing and indicate compliance/failure in relationship to the accepted criteria of the test.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating hollow metal door and frame assemblies of the type specified herein.

B. Installer's Qualifications: An employer of workers trained and approved by manufacturer.

C. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer.

D. All door and frame assemblies shall meet the requirements of Paragraph 1.5 above.

E. Preinstallation Conference: Conduct conference at Project site

- F. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- G. Fire-Rated Door Assemblies: 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 UL10C (neutral pressure at 40" above sill) or UL 10C.
  - 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
  - 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
  - 3. Smoke Control Door Assemblies: Comply with NFPA 105.
    - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- H. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are 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. Provide labeled glazing material.
- I. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
  - 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
  - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## 1.9 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
- C. All hollow metal work shall be warranted from defects in workmanship and quality for a period of one (1) year from installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
  - 1. CECO Door Products (C).
  - 2. Curries Company (CU).
  - 3. Steelcraft (S).

### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications. Doors shall be made of commercial quality steel, free of buckles, waves or any other defects caused by the use of improperly leveled sheets.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 metallic coating.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

- E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- G. Glazing: Schedule Type G-2, Tempered, laminated impact-resistance glazing., 9/16" thick. Clear.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

### 2.3 CUSTOM HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
  - 1. Design: Flush panel.
  - 2. Core Construction:
    - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
    - b. Steel-Stiffened Core: 0.030-inch- thick, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart, spot welded to face sheets a maximum of 5 inches o.c. Fill spaces between stiffeners with inorganic, non-combustible batt type insulation of minimum 0.6-lb/cu. ft. density or sound deadener applied to inside surfaces of face sheets.
  - 3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
  - 4. Vertical Edges for Single-Acting Doors: Beveled 1/8 inch in 2 inches.
  - 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
    - a. Reinforce tops and bottoms of doors with inverted horizontal channels of same material as face sheet so flanges of channels are even with bottom and top edges of face sheets
  - 6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
  - 7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.



- a. Lock Face, Flush Bolts, Closers and Concealed Holders: 0.105 inch thick.
  - b. All other surface-mounted hardware: 0.075 inch thick.
8. Head Reinforcement: Provide minimum 0.105-inch- thick, continuous steel channel or angle stiffener for full width of all openings.

C. Manufacturers Basis of Design:

1. Curries Company (CU) - Polyurethane Core

2.4 SPECIAL FUNCTION HOLLOW METAL DOORS

- A. Stainless Steel Doors: Subject to the same compliance standards and requirements as standard hollow metal doors, provide 1-3/4" thick doors fabricated from #304 alloy (#316 alloy high corrosive resistant where indicated) stainless steel material complying with ANSI/ASTM A167. Fabricate doors with stainless flush top closure, and 12 gauge minimum stainless steel hinge reinforcements and 18 gauge minimum stainless steel lock reinforcements.

1. Finish: Provide finish (No.4 with visible grain or No. 8, mirror) as directed.
2. Manufacturers Basis of Design:
  - a. Curries Company (CU) - Stainless Steel Series.

2.5 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
  2. Frames: Minimum 16 gauge (0.053-inch - thick steel sheet.
  3. Manufacturers Basis of Design:
    - a. Curries Company (CU) - M Series.
- C. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.6 SPECIAL FUNCTION HOLLOW METAL FRAMES

- A. Stainless Steel Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated frames fabricated from #304 alloy (#316 alloy, high corrosive resistant where indicated) stainless steel material in finish matching stainless steel doors.

1. Manufacturers Basis of Design:
  - a. Curries Company (CU) - Stainless Steel Frame Series.

## 2.7 FRAME ANCHORS

- A. Jamb Anchors:
  1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from metallic coated material, not less than 0.100 inchthick, with corrugated or perforated straps not less than 2 incheswide by 10 incheslong; or wire anchors not less than 0.177 inchthick.
  2. Floor Anchors: Provide floor anchors for each jamb that extends to the floor, formed from same material as frames, not less than 0.074 inch thick, and as follows:
    - a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners, welded to bottom of jambs.
  3. Stud Wall Type: Designed to engage stud and not less than 0.042 inchthick.
  4. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from metallic coated material, not less than 0.042 inchesthick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

## 2.8 LITE OPENINGS

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.
- E. Loose Stops for Glazed Lites in Frames: Minimum 0.036 inch thick, fabricated from same material as frames in which they are installed.

## 2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.019 inches thick.

## 2.10 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
  - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
  - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
  - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
  - 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
  - 5. Thickness of sheet metal: +0.015-inch; -0.007-inch.
  - 6. Width: +3/64-inch.
  - 7. Height: +3/64-inch.
  - 8. Thickness of door: +1/16-inch.
  - 9. Hardware cutout dimensions: +0.015-inch; -0-inch.
  - 10. Hardware location: +1/32-inch.
- D. Hollow Metal Frames:
  - 1. Shipping Limitations: 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.
  - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
    - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
  - 3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
  5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
  6. Provide countersunk, flat- or oval-head Torx screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
  7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
  8. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  9. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  10. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry 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) Two anchors per jamb up to 60 inches high.
      - 2) Three anchors per jamb from 60 to 90 inches high.
      - 3) Four anchors per jamb from 90 to 120 inches high.
      - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.
      - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
  11. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
    - 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.
  12. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
  13. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Manufacturing tolerance shall be maintained within the following limits:
1. Frames for single door or pair of doors:

- a. Thickness of sheet metal: +0.015-inch; -0.007-inch.
  - b. Width (measured between rabbets at head): +1/16-inch; -1/32-inch.
  - c. Height (total length of jamb rabbet): +3/16-inch.
2. Cross Sectional profile dimensions:
- a. Face: +1/32-inch.
  - b. Stop: +/-1/32-inch.
  - c. Rabbet: +1/32-inch.
  - d. Depth: +1/32-inch.
  - e. Throat: +/-1/16-inch.
- F. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
- 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
  - 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
  - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
  - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
  - 5. Hardware Locations: The location of hardware on doors and frames is listed below. All dimensions except hinge locations are from finished floor. Finished floor is defined as the top surface of the floor except when resilient tile or carpet is used, then it is the top of the concrete slab.
    - a. Hinges:
      - 1) Top: five inches from frame head to top of hinge.
      - 2) Bottom: ten inches from finished floor to bottom of hinge.
      - 3) Intermediate: centered between top and bottom hinges.
    - b. Locks and Latches: 38-inches to centerline of knob.
    - c. Deadlocks: 48-inches to centerline of cylinder.
    - d. Panic Hardware: 38-inches to centerline of cross bar or as shown on hardware template.
    - e. Door Pulls: 42-inches to center of grip.
    - f. Push/Pull Bars: 42-inches to centerline of bar.
    - g. Push/Pull Plates: 48-inches to centerline of plate.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
- 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide loose stops and moldings on inside of hollow metal work.
  - 4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.11 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
  - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
  - a. Install frames with removable glazing stops located on secure side of opening.
  - b. Install door silencers in frames before grouting.
  - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
  - d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
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 powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
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.

- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
  - a. Jambs and Head: 3/16 inch.
  - b. Between Edges of Pairs of Doors: 1/16 inch.

- c. Between Bottom of Door and Top of Threshold: Maximum 1/16 inch.
  - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
- 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
  - 1. Secure stops with countersunk flat- or oval-head Torx screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

### 3.4 FIELD QUALITY ASSURANCE

- A. The City reserves the right to select any stainless steel door delivered to the site (prior to installation) and subject same to testing as per Paragraph 1.5 of this Section. Testing may include the destruction of the stainless steel door. If the results of the testing indicate that the stainless steel door does not meet the requirements of this Section the Contractor must remove all stainless steel doors from the site and provide new stainless steel doors at his sole expense. If the results of the testing indicate that the stainless steel door does meet the requirements of this Section the Contractor shall provide a new door as per the requirements of Section 012500.

### 3.5 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 and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

### 3.6 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
  - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.



END OF SECTION 081113

PROJECT No. 16228E-03-01  
SECTION 08113 - 15  
CUSTOM HOLLOW METAL DOORS AND FRAMES

## SECTION 081119

### CUSTOM STAINLESS-STEEL DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes the following for aesthetic applications:
  - 1. Stainless-steel, hollow-metal doors.
  - 2. Stainless-steel, hollow-metal frames.
- B. Related Sections include the following:
  - 1. Division 04 Section "Unit Masonry" for building anchors into and grouting stainless-steel frames in masonry construction.
  - 2. Division 08 Section "Hollow Metal Doors and Frames" for doors not constructed of stainless steel.
  - 3. Division 08 Section "Door Hardware" for door hardware for stainless-steel doors.
  - 4. Division 08 Section "Glazing" for glazed lites in stainless-steel doors.
  - 5. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

##### 1.3 DEFINITIONS

- A. Stainless-Steel Sheet Thicknesses: Indicated as the specified thicknesses for which over- and under-thickness tolerances apply, according to ASTM A 480/A 480M.

##### 1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, and finishes for each type of stainless-steel door and frame specified.
- B. Shop Drawings: In addition to requirements below, provide a schedule of stainless-steel doors and frames using same reference numbers for details and openings as those on Drawings:
  - 1. Elevations of each door design.
  - 2. Details of doors, including vertical and horizontal edge details.
  - 3. Frame details for each frame type, including dimensioned profiles.

4. Details and locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of anchorages, accessories, joints, and connections.
  7. Details of glazing frames and stops showing glazing.
  8. Details of conduit and preparations for electrified door hardware and controls.
- C. Coordination Drawings: Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware, and preparations for power and electrified control systems.
- D. Construction Samples:
1. Door: 12-inch by 12-inch corner section with hinge preparation showing top and internal construction.
  2. Frame: 12-inch by 12-inch corner section showing welded joint of head to jamb. Include hinge, mortise, reinforcement and grout guard in one rabbet and glazing stop applied as specified in the opposite rabbet. Glazing stop must be applied to both head and jamb section to show corner joint.
  3. All samples submitted shall be of the production type and shall represent in all respects the minimum quality of the Work to be furnished by the manufacturer. No Work represented by the samples shall be fabricated until the samples are approved; any downgrading of quality demonstrated by comparison with the samples may be cause for rejection of the Work.
  4. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 inches by 5 inches.
- E. Qualification Data: For Manufacturer and Installer.
- F. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of stainless-steel door and frame.

## 1.5 TESTING AND PERFORMANCE

- A. Performance Test for Steel Doors and Hardware Reinforcements (ANSI A151.1).
- B. Test specimen shall be at least a 3' x 7' (nominal size), 1-3/4"-thick stainless steel door.
1. Test specimen door in accordance with ANSI A151.1 for Level "A" doors (1,000,000 cycles).
  2. Test specimen door in accordance with ANSI A151.1 for twist test: maximum test pressure 300 lbs.
- C. All test reports shall include a description of the test specimen, procedures used in testing and indicate compliance/failure in relationship to the accepted criteria of the test.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating hollow metal door and frame assemblies of the type specified herein.
- B. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- C. Source Limitations: Obtain stainless-steel doors and frames through one source from a single manufacturer.
- D. All door and frame assemblies shall meet the requirements of Paragraph 1.5 above.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Meetings."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high, wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.
  - 1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating stainless-steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

## 1.9 COORDINATION

- A. Coordinate installation of anchorages for stainless-steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

## 1.10 WARRANTY

- A. All hollow metal work shall be warranted from defects in workmanship and quality for a period of one (1) year from installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ceco Door Products; an ASSA ABLOY Group Company.
  - 2. CURRIES Company; an ASSA ABLOY Group Company.
  - 3. National Custom Hollow Metal Doors & Frames.
  - 4. Pioneer Industries, Inc.
  - 5. Steelcraft; an Allegion Company.

### 2.2 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, austenitic stainless steel, Type indicated.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching stainless-steel door frames of type indicated.
- G. Grout: Comply with ASTM C 476, with a slump of 4 inches for stainless-steel door frames built into concrete or masonry, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

- I. Glazing: Schedule Type G-4 Impact and vandalism resistant glazing to meet the following specifications:
1. Solid Glazing: 7/8" nominal thickness\  
Basis of Design: Global Security Secur-Tem+Poly 2114
    - a. U-Value: .70
    - b. SHGC: .80
    - c. Light Transmission: .69
    - d. Coatings: TBD
    - e. Forced Entry: H.P. White Level III-TP-0500.02, ASTM 1915 Grade 2, WMFL Level II
    - f. Ballistic: 0.38 special handgun, 3 shots in an 8" circle, 158 grain, 20 feet; 0.357 magnum revolver, 3 shots in an 8" circle, 158 grain, 25 feet. Spall with no penetration.
    - g. Standards:
      - 1) ANSI Z97.1: ASTM C 1349
      - 2) CPSC 16 CFR 1201 (Category I and II): ASTM C 1422
      - 3) ASTM C 1036: ASTM C 1048

OR

2. Insulating glass units comprised of tempered exterior pane and laminated interior pane, 7/8" nominal overall thickness or greater as installation allows.  
Basis of Design: Tempered exterior pane + Global Security ChildGuard 2118 (5/16" th)
  - a. U-Value: TBD
  - b. SHGC: TBD
  - c. Light Transmission: TBD
  - d. Gas Fill: Argon
  - e. Coatings: TBD
  - f. Black spline and spacer bars
  - g. Forced Entry: ASTM F1233-08 Class 1.4 to 17 minutes, 5-aa1 to 16 minutes
  - h. Ballistic: .38 Special handgun, 3 shots in an 8" circle, 158 grain lead, 20 feet. Spall with no penetration per HP White-TP-0500.03.
  - i. Standards:
    - 1) ANSI Z97.1: ASTM C 1349
    - 2) CPSC 16 CFR 1201 (Category I and II): ASTM C 1422
    - 3) ASTM C 1036: ASTM C 1048

- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.3 CUSTOM STAINLESS-STEEL DOORS

- A. General: Provide doors, not less than 1-3/4 inches thick, of seamless hollow construction, unless otherwise indicated. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces.
1. Visible joints or seams around glazed lite inserts are not permitted.
  2. For single-acting swing doors, bevel both vertical edges 1/8 inch in 2 inches.

- B. Face Sheets: Fabricated from minimum 0.075-inch- thick, stainless-steel sheet, Type as follows:
1. Doors for Aesthetic Applications: As indicated in the Door and Frame Schedule.
  2. Where solid doors are indicated: Type 304.
  3. Finish to be brass where indicated on drawings.
- C. Core Construction: Fabricate doors with core indicated. Provide thermal-resistance-rated cores for exterior doors.
1. Steel-Stiffened Core: 0.030-inch- thick, steel vertical stiffeners extending full-door height, with vertical webs spaced not more than 6 inches apart, spot welded to face sheets a maximum of 5 inches o.c. Spaces filled between stiffeners with glass- or mineral-fiber insulation.
- D. Top and Bottom Channels: Minimum 0.060-inch- thick, stainless steel channel fully welded to face sheets.
1. Close bottom edge with an additional minimum 0.050-inch- thick, stainless-steel closing channel and top edge with same thickness of stainless-steel filler channel, so webs of channels are flush with bottom and top door edges. Provide weep-hole openings in bottom of doors to permit entrapped moisture to escape. Seal joints in top edges of doors against water penetration.
- E. Hardware Reinforcement: Fabricate reinforcement plates from stainless steel or steel, as indicated in Part 2 "Fabrication" Article, to comply with the following minimum sizes:
1. Hinges: Minimum 0.180 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  2. Lock Face, Flush Bolts, Closers: Minimum 0.105 inch thick.
  3. All Other Surface-Mounted Hardware: Minimum 0.075 inch thick.

## 2.4 CUSTOM STAINLESS-STEEL FRAMES

- A. General: Fabricate frames of construction indicated, with faces of corners mitered and contact edges closed tight.
1. Frames for Doors: Welded.
  2. Door Frames for Openings 48 Inches Wide or Less: Fabricated from 0.070-inch- thick, stainless-steel sheet.
- B. Material: Fabricate frames from stainless-steel sheet, Type as follows:
1. Frames for Aesthetic Applications: Type 304 where matching door type 304
  2. Frame finish to match adjacent door finish.
  3. Frame profile per schedule on drawings.
  4. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.

- C. Hardware Reinforcement: Fabricate reinforcement plates from stainless steel or steel, as indicated in Part 2 "Fabrication" Article, to comply with the following minimum sizes:
  - 1. Hinges and Pivots: 0.195 inch thick by 1-1/2 inches wide by 10 inches longer than hinge, secured by not less than 6 spot welds.
  - 2. Strikes, Flush Bolts, and Closers: 0.105 inch.
  - 3. Hold-Open Arms, Panic Devices and other surface mounted hardware: 0.105 inch.
- D. Head Reinforcement: Minimum 0.105-inch- thick, steel channel or angle stiffener, for full width of opening, welded to back of frame at head flush with top of frame.
- E. Jamb Anchors: Formed from material indicated in Part 2 "Fabrication" Article.
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.100 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.156 inch thick.
- F. Floor Anchors: Formed from material indicated in Part 2 "Fabrication" Article, not less than 0.074 inch thick, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners, welded to bottom of jambs and mullions.
- G. Plaster Guards: Formed from material indicated in Part 2 "Fabrication" Article, not less than 0.019 inch thick.

## 2.5 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.036 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with stainless-steel frames, minimum 5/8-inch high, unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.036 inch thick, fabricated from same material as frames in which they are installed.

## 2.6 FABRICATION

- A. General: Fabricate stainless-steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Stainless-Steel Doors: Comply with ANSI A250.4, Level A.



1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  2. Glazed Lites: Factory cut openings in doors.
  3. Edges: Door face sheets joined at vertical edges by continuous weld extending full height of door; with edges ground and polished, providing smooth, flush surfaces with no visible seams.
  4. Doors for Aesthetic Applications: Fabricate doors with door faces of Type 304 stainless-steel sheet and internal components, including stiffeners and hardware reinforcements, from cold-rolled, hot-rolled, or metallic-coated steel sheet.
  5. Manufacturing tolerance shall be maintained within the following limits:
    - a. Doors:
      - 1) Thickness of sheet metal: +0.015-inch; -0.007-inch.
      - 2) Width: +3/64-inch.
      - 3) Height: +3/64-inch.
      - 4) Thickness of door: +1/16-inch.
      - 5) Hardware cutout dimensions: +0.015-inch; -0-inch.
      - 6) Hardware location: +1/32-inch.
- C. Stainless-Steel Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
1. Frames for Aesthetic Applications: Fabricate frames with internal components, including anchors, plaster guards, and hardware reinforcements, from cold-rolled, hot-rolled, or metallic-coated steel sheet.
  2. Manufacturing tolerance shall be maintained within the following limits:
    - a. Frames for single door or pair of doors:
      - 1) Thickness of sheet metal: +0.015-inch; -0.007-inch.
      - 2) Width (measured between rabbets at head): +1/16-inch; -1/32-inch.
      - 3) Height (total length of jamb rabbet): +3/16-inch.
    - b. Cross Sectional profile dimensions:
      - 1) Face: +1/32-inch.
      - 2) Stop: +/-1/32-inch.
      - 3) Rabbet: +1/32-inch.
      - 4) Depth: +1/32-inch.
      - 5) Throat: +/-1/16-inch.
  3. Provide countersunk, flat- or oval-head Torx screws and bolts for exposed fasteners, unless otherwise indicated.
  4. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
  5. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
  6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  7. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry 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) Two anchors per jamb up to 60 inches in height.

- 2) Three anchors per jamb from 60 to 90 inches in height.
8. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Hardware Preparation: Factory prepare stainless-steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
  2. Locate door hardware as indicated, or if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
  3. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
  4. Hardware Locations: The location of hardware on doors and frames is listed below. All dimensions except hinge locations are from finished floor. Finished floor is defined as the top surface of the floor except when resilient tile or carpet is used, when it is the top of the concrete slab.
    - a. Hinges:
      - 1) Top: five inches from frame head to top of hinge.
      - 2) Bottom: ten inches from finished floor to bottom of hinge.
      - 3) Intermediate: centered between top and bottom hinges.
    - b. Locks and Latches: 38-inches to centerline of knob.
    - c. Deadlocks: 48-inches to centerline of cylinder.
    - d. Panic Hardware: 38-inches to centerline of cross bar or as shown on hardware template.
    - e. Door Pulls: 42-inches to center of grip.
    - f. Push/Pull Bars: 42-inches to centerline of bar.
    - g. Push/Pull Plates: 48-inches to centerline of plate.
- E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
  2. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.7 STAINLESS-STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Remove tool and die marks and stretch lines or blend into finish.

1. Brass Finish: Where indicated on drawings, provide a chemically bonded color. Mirror or satin finish to be selected upon submission of initial samples.
  2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches.
    - a. Grain for Doors: Vertical (long dimension of door).
    - b. Grain for Frame Jambs: Vertical (long dimension of jamb).
    - c. Grain for Frame Heads: Horizontal (long dimension of head).
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish stainless-steel doors and frames after assembly.
- D. Directional Satin Finish: No. 4 finish.
- E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stainless-steel doors and frames.
1. Examine roughing-in for embedded and built-in anchors to verify actual locations of stainless-steel door-frame connections before frame installation.
  2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace stainless-steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install stainless-steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Stainless-Steel Frames: Install stainless-steel frames for doors and other openings, of size and profile indicated.
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. Install frames with removable glazing stops located on secure side of opening.
    - b. Install door silencers in frames before grouting.
    - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - d. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - e. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.
  2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors, if so indicated and approved on Shop Drawings.
  3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 04 Section "Unit Masonry."
  4. Installation Tolerances: Adjust stainless-steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Stainless-Steel Doors: Fit non-fire-rated doors accurately in frames with the following clearances:

1. Non-Fire-Rated Doors:

- a. Between doors and frames, at head and jambs: 3/16-inch.
- b. Between edges of pairs of doors: 1/16-inch.
- c. At door sills where a threshold is used: 1/16-inch between bottom of door and top of threshold.
- d. At door sills where no threshold is used: 3/4-inch.

D. Glazing: Comply with installation requirements in Division 08 Section "Plastic Glazing" and with stainless-steel door and frame manufacturer's written instructions.

- 1. Secure stops with countersunk flat- or oval-head Torx screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

3.4 FIELD QUALITY ASSURANCE

- A. The City reserves the right to select any stainless steel door delivered to the site (prior to installation) and subject same to testing as per Paragraph 1.5 of this Section. Testing may include the destruction of the stainless steel door. If the results of the testing indicate that the stainless steel door does not meet the requirements of this Section the Contractor must remove all stainless steel doors from the site and provide new stainless steel doors at his sole expense. If the results of the testing indicate that the stainless steel door does meet the requirements of this Section the Contractor shall provide a new door as per the requirements of Section 012500.

3.5 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 stainless-steel doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off stainless-steel doors and frames immediately after installation.
- C. Stainless-Steel Touchup: Immediately after erection, smooth any abraded areas of stainless steel and polish to match undamaged finish.

END

## SECTION 083113

### ACCESS DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Access doors and frames.

###### B. Related Requirements:

1. Section 077200 "Roof Accessories" for roof hatches.

##### 1.2 ALLOWANCES

- ###### A. Access doors and frames are part of an access door and frame allowance.

##### 1.3 ACTION SUBMITTALS

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

1. Include construction details material descriptions, dimensions of individual components and profiles, and finishes.

- ###### B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.

- ###### C. Product Schedule: For access doors and frames.

##### 1.4 CLOSEOUT SUBMITTALS

- ###### A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

#### PART 2 - PRODUCTS

##### 2.1 PERFORMANCE REQUIREMENTS

- ###### A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

## 2.2 ACCESS DOORS AND FRAMES

- A. Wall installed access doors shall be stainless steel frame and panel with off-set concealed piano (continuous) hinge and key operated vandal-resistant lock.
- B. Ceiling installed access doors shall be baked enamel (bonderized) steel frame and panel with piano (continuous) hinge and key operated vandal resistant lock.
- C. Flush Access Doors with Exposed Flanges for installation in wall with Ceramic Tile:
  - 1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
  - 2. Optional Features: Off-set concealed Piano hinges; Masonry anchors where needed.
  - 3. Locations: Wall and ceiling.
  - 4. Door Size: As required or 2'x4' typical.
  - 5. Stainless Steel Sheet for Door: Nominal 0.062 inch, 16 gage, ASTM A480/A480M No. 4 finish.
  - 6. Frame Material: Same material, thickness, and finish as door.
  - 7. Latch and Lock: key-operated vandal resistant lock.
- D. Flush Access Doors with Concealed Flanges for installation in GWB or plaster:
  - 1. Description: Face of door flush with frame; with concealed flange for gypsum board or plaster installation and concealed hinge.
  - 2. Optional Features: Off-set concealed Piano hinges; Masonry anchors where needed.
  - 3. Locations: Wall and ceiling.
  - 4. Door Size: .
  - 5. Stainless Steel Sheet for Door: Nominal 0.062 inch, 16 gage, ASTM A480/A480M No. 4 finish.
  - 6. Frame Material: Same material and thickness as door.
  - 7. Latch and Lock: key-operated vandal resistant lock.

## 2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 316. Remove tool and die marks and stretch lines, or blend into finish.
- E. Stainless Steel Flat Bars: ASTM A666, Type 316. Remove tool and die marks and stretch lines, or blend into finish.
- F. Frame Anchors: Same material as door face.
- G. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

## 2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
  - 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
  - 2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded-metal lath and exposed casing bead welded to perimeter of frames.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.
  - 1. For recessed doors with plaster infill, provide self-furring expanded-metal lath attached to door panel.
- E. Latch and Lock Hardware:
  - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
  - 2. Keys: Furnish two keys per lock and key all locks alike.

## 2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat.
    - a. Color: As selected by Architect from full range of industry colors.



E. Stainless Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: ASTM A480/A480M No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - a. Run grain of directional finishes with long dimension of each piece.
  - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 FIELD QUALITY CONTROL

- A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- C. Prepare and submit separate inspection report for each fire-rated access door indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

## SECTION 085200

### WOOD WINDOWS

#### Part 1 General

##### 1.1 Section Includes

- A. Round-top, fixed, double-hung windows complete with hardware, glazing, certified mulls, weather strip, exterior screen, grilles-between-the-glass, simulated divided lite, jamb extension, screen, and standard or specified anchors, trim, attachments, factory-applied historic casing(s) and accessories.

##### 1.2 Related Sections

- A. Section 06 22 00 – Millwork: Wood trim other than furnished by window manufacturer
- B. Section 07 92 00 – Joint Sealant: Sill sealant and perimeter caulking

##### 1.3 References

- A. American Society for Testing Materials (ASTM):
  - 1. E283: Standard Test method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
  - 2. E330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Door by Uniform Static Air Pressure Difference.
  - 3. E547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.
  - 4. E2190: Specification for Sealed Insulated Glass Units.
  - 5. C1036: Standard Specification for Flat Glass.
  - 6. E 2112: Standard Practice for Installation of Exterior Windows, Doors and Skylights.
  - 7. E2068: Standard Test Method for Determination of Operating Force of Sliding Windows and Doors. (Glider and Double Hung Only)
  - 8. F 2090-17: Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms.
- B. American Architectural Manufacturers Association/Window and Door Manufacturers Association (AAMA/WDMA/CSA):
  - 1. AAMA/WDMA/CSA 101/I.S.2/A440-08, Standard/Specification for windows, doors and skylights.

SECTION 085200

WOOD WINDOWS

- 2. AAMA/WDMA/CSA 101/I.S.2/A440-11, North American Fenestration Standard/Specification for windows, doors and skylights.
- C. WDMA I.S.4: Industry Standard for Water Repellent Preservative Treatment for Millwork.
- D. Window and Door Manufactures Association (WDMA): 101/I.S.2 WDMA Hallmark Certification Program.
- E. Sealed Insulating Glass Manufactures Association/Insulating Glass Certification Council (SIGMA/IGCC).
- F. American Architectural Manufactures Association (AAMA): 2605: Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
- G. National Fenestration Rating Council (NFRC):
  - 1. 101: Procedure for Determining Fenestration Product thermal Properties.
  - 2. 200: Procedure for Determining Solar Heat Gain Coefficients at Normal Incidence.
- H. Window Covering Manufacturer’s Association
  - 1. A100.1: American National Standard for Safety of Corded Window Covering Products.

**1.4 System Description**

A. Design and Performance Requirement:

Product	Air Test to PSF	Water Tested to PSF	Structural Tested to PSF	Certification Rating	Design Pressure	Overall Width		Overall Height	
						in	mm	in	mm
Double Hung	1.57	7.5	75	LC-PG 50	DP50	--	(--)	87 1/--	(--)
Double Hung, Round Top, Picture, Transom (fixed)	1.57	7.5	75	CW-PG 50	DP50	--1/2	(--)	103 --/2	(--)

**1.5 Submittals**

- A. Shop Drawings: Submit shop drawings under provision of Section 01 33 23.
- B. Product Data: Submit catalog data under provision of Section 01 33 23.
- C. Samples:
  - 1. Submit corner section under provision of section 01 33 23.

## SECTION 085200

### WOOD WINDOWS

2. Include glazing system, quality of construction and specified finish.
- D. Quality Control Submittals: Certificates: submit manufacture's certification indicating compliance with specified performance and design requirement under provision of section 01 33 23.

#### **1.6 Quality Assurance**

- A. Requirements: consult local code for IBC [International Building Code] and IRC [International residential Code] adoption year and pertinent revisions for information on:
  1. Egress, emergency escape and rescue requirements.
  2. Basement window requirements.
  3. Windows fall prevention and/or window opening control device requirements.

#### **1.7 Delivery**

- A. Comply with provisions of Section 01 65 00.
- B. Deliver in original packaging and protect from weather.

#### **1.8 Storage and Handling**

- A. Prime and seal wood surfaces, including to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation.
- B. Store window units in an upright position in a clean and dry storage area above ground to protect from weather under provision of Section 01 66 00.

#### **1.9 Warranty**

Complete and current warranty information is available at [marvin.com/warranty](http://marvin.com/warranty). The following summary is subject to the terms, condition, limitations and exclusions set forth in the Marvin Windows and Door Limited Warranty and Products in Coastal Environments Limited Warranty Supplement:

## SECTION 085200

### WOOD WINDOWS

- A. Clear insulating glass with stainless steel spacers is warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of purchase. Glass is warranted against stress cracks caused by manufacturing defects from ten (10) years from the original date of purchase.
- B. Standard exterior aluminum cladding finish is warranted against manufacturing defects resulting in chalk, fade and loss of adhesion (peel) per the American Architectural Manufacturer's Association (AAMA) Specification 2605-11 Section 8.4 and 8.9 for twenty (20) years from the original date of purchase.
- C. Factory applied interior finish is warranted to be free from finish defects for a period of five (5) years from the original date of purchase.
- D. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

## Part 2 Products

### 2.1 Manufactured Units

- A. Description: Ultimate Double Hung Round Top G2 (and related stationary units) as manufactured by Marvin Windows and Doors, Warroad, Minnesota.

### 2.2 Frame Description

- A. Lineal Components - Interior: Non finger-jointed Pine surfaces with finger jointed core; optional non finger-jointed Douglas Fir surfaces with finger jointed core; optional non finger-jointed Vertical Grain Douglas Fir surfaces with finger jointed core; optional non finger-jointed White Oak surfaces with finger jointed core; optional non finger-jointed Cherry surfaces with finger jointed core; optional non finger-jointed Mahogany surfaces with finger jointed core.
  - 1. Kiln dried to moisture content no greater than 12 percent at the time of fabrication.
  - 2. Water repellent, preservative treated in accordance with ANSI/WDMA I.S.4.
- B. Radius Components - Interior: Blocked finger-jointed Pine; optional blocked finger-jointed Douglas Fir; optional Vertical Grain Douglas Fir; optional blocked finger-jointed White Oak, optional blocked finger-jointed Cherry; optional blocked finger-jointed Mahogany.
  - 1. Kiln dried to moisture content no greater than 12 percent at the time of fabrication.
  - 2. Water repellent, preservative treated in accordance with ANSI/WDMA I.S.4.

## SECTION 085200

### WOOD WINDOWS

- C. Frame exterior clad with 0.050" (1.3mm) thick extruded aluminum.
- D. Frame thickness: 1 25/32" (45mm) head and jambs.
- E. Frame depth: Frame depth had an overall 5 21/32" jamb (144mm). 4 9/16" (116mm) jamb depth from the nailing fin plane to the interior face of the frame for new construction.
- F. Sill assembly including the sill liner: 2 7/32" (56mm).
- G. Factory-applied historic profile extrusion

### 2.3 Sash Description

- A. Lineal Components - Interior: non finger-jointed Douglas Fir.
  - 1. Kiln dried to moisture content no greater than twelve (12) percent at the time of fabrication.
  - 2. Water repellent preservative treated with accordance with WDMA I.S.4.
- B. Radius Components – Interior: Blocked finger-jointed Pine; optional blocked finger-jointed Douglas Fir; optional Vertical Grain Douglas Fir; optional blocked finger-jointed White Oak; optional blocked finger-jointed Cherry; optional blocked finger-jointed Mahogany.
  - 1. Kiln dried to moisture content no greater than twelve (12) percent at the time of fabrication.
  - 2. Water repellent preservative treated with accordance with WDMA I.S.4.
- C. Sash exterior clad with 0.050" (1.3mm) thick extruded aluminum.
- D. Sash thickness: 1 3/4" (44mm)
- E. Operable sash tilt to interior for cleaning or removal.
- F. Sash Options:
  - 1. Standard: Equal
- G. Exterior Cope Profile: Putty
- H. Interior Sash Sticking:
  - 1. Standard: Ogee

### 2.4 Glazing

SECTION 085200

WOOD WINDOWS

- A. Select quality complying with ASTM C1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E2190.
- B. Glazing method: Insulating glass or solid laminated glazing as per schedule.
- C. Glazing seal: Silicone bedding on interior and exterior.
- D. Glass Type G-3: Impact-resistant insulated glass units with tempered exterior pane and laminated interior pane. Clear, low E w/ argon, black spacer bar. Thermal performance and shading characteristics to be selected from within manufacturer's complete product line.

U: 0.45 max, SHGC: 0.4.

- E. Glass Schedule Type G-4. Impact and vandalism resistant glazing to meet the following specifications:

- 1. Solid Glazing: 7/8" nominal thickness\  
Basis of Design: Global Security Secur-Tem+Poly 2114
  - a. U-Value: .70
  - b. SHGC: .80
  - c. Light Transmission: .69
  - d. Coatings: TBD
  - e. Forced Entry: H.P. White Level III-TP-0500.02, ASTM 1915 Grade 2, WMFL Level II
  - f. Ballistic: 0.38 special handgun, 3 shots in an 8" circle, 158 grain, 20 fee; 0.357 magnum revolver, 3 shots in an 8" circle, 1 58 grain, 25 feet. Spall with no penetration.
  - g. Standards:
    - 1) ANSI Z97.1: ASTM C 1349
    - 2) CPSC 16 CFR 1201 (Category I and II): ASTM C 1422
    - 3) ASTM C 1036: ASTM C 1048

OR

- 2. Insulating glass units comprised of tempered exterior pane and laminated interior pane, 7/8" nominal overall thickness or greater as installation allows.  
Basis of Design: Tempered exterior pane + Global Security ChildGuard 2118 (5/16" th)
  - a. U-Value: 0.45 max
  - b. SHGC: .40
  - c. Gas Fill: Argon
  - d. Coatings: Low E coatings on surface 2 and/or 3
  - e. Black spline and spacer bars
  - f. Forced Entry: ASTM F1233-08 Class 1.4 to 17 minutes, 5-aa1 to 16 minutes
  - g. Ballistic: .38 Special handgun, 3 shots in an 8" circle, 158 grain lead, 20 feet. Spall with no penetration per HP White-TP-0500.03.
  - h. Standards:
    - 1) ANSI Z97.1: ASTM C 1349
    - 2) CPSC 16 CFR 1201 (Category I and II): ASTM C 1422
    - 3) ASTM C 1036: ASTM C 1048

SECTION 085200

WOOD WINDOWS

**2.5 Finish**

- A. Exterior Aluminum Clad: Fluoropolymer modified acrylic topcoat applied over primer. Meets or exceeds AAMA 2605 requirements.
  - 1. Exterior Aluminum Clad color from within manufacturer's standard color options including neutrals, browns, whites and off-whites at minimum.
- B. Interior Finish options:
  - 1. Factory applied enamel primer + 2 coats of finish in field. Color to meeting Architect's specifications.

OR

- 2. Factory applied water-borne acrylic enamel clear coat. Applied in two separate coats with light sanding between coats. Meets WDMA TM-14 requirements. Colors to match Architect's specifications. Touch-up after installation.

**2.6 Hardware**

- A. Locking system that provides locking, unlocking, balancing, and tilting of the sash members.
- B. Lock Handle Assembly
  - 1. Material:
    - a. Zinc die-cast;
    - b. Finish: Brushed Chrome.
  - 2. Design Feature and Components
    - a. To unlock unit, turn the handle 135°.
    - b. Lock automatically locks when both sash are closed.
    - c. To tilt the bottom sash for wash mode, the bottom sash must be unlocked and raised a few inches; push the button on top of the lock handle and rotate the handle 180°.
    - d. To tilt the top sash for wash mode, the bottom sash must be tilted and/or removed from the frame; lower the top sash to a good working height, retract the tilt latches; with removal tool on the top stile and tilt sash out of the frame.
    - e. Custodial hardware – Brushed Chrome.
- A. Bottom Rail Lock Actuator Assembly - Lift Lock (Optional for Single Hung)



## SECTION 085200

### WOOD WINDOWS

#### 1. Material

- a. Zinc die-cast
- b. Available finishes: Brushed chromel

#### 2. Design Feature and Components

- a. Does not contain Check Rail Lock Actuator Assembly or Strike Assembly
- b. Available in Traditional and Contemporary designs
- c. To unlock unit, lift the lock
- d. Lock automatically locks when bottom sash is closed.
- e. To tilt the bottom sash for wash mode, raise the bottom sash and manually retract the latches.
- f. Custodial hardware: brushed chrome

#### B. Latches

##### 1. Bottom sash latch

###### a. Material

- i. Bolt: Glass-filled nylon
- ii. Latch housing: Acetal
- iii. Sash latch reinforcement: Stainless steel

##### 2. Top sash tilt latch

###### a. Material

- i. Bolt: Glass-filled nylon
- ii. Latch housing: Glass-filled nylon

3. Latches accommodate travel of sash in frame, and tilting into wash-mode.

4. Color: brushed chrome

#### C. Strike Assembly

##### 1. Material

Zinc die-cast strike plate and injection-molded Acetal housing and button

Available finishes: brushed Chrome

##### 2. Strike assembly accommodates locking/un-locking

## SECTION 085200

### WOOD WINDOWS

- D. Balance System (balance system determined by sash weight):
1. Block & tackle balances
  2. Hybrid spiral balances
- E. Factory-applied Window Opening Control Device (WOCD) is a sash limiter that prevents the window opening more than 4" vertically. It meets ASTM F2090-17 specifications for window fall prevention standards. The system consists of a device that allows for egress (when applied to an egress size window) by bypassing the 4" stop feature.
1. Material
    - a. WOCD device: zinc die-cast
    - b. WOCD strike plate: nylon
  2. Two WOCD's applied to each double and single hung window and will be recessed into the stiles of the top sash.
  3. Default color matches lock handle.
  4. Strike plate mounted to the bottom sash check rail.
  5. Strike plate color to match weather strip.
- F. Sash Limiter
1. Bottom Sash Limiter
    - a. Available on all operator configurations, and StormPlus IZ3
    - b. Selectable bottom sash locations, 4", 6" or 8" Net Clear Opening (NCO)
    - c. Non-tilt hardware is default, and a sash removal tool is required in order to bypass the Sash limiter for sash removal (tilt wash mode)
    - d. Standard application is factory applied. Available for field retrofit applications.
    - e. Color: Will align with the Interior Weather Strip Package selection
  2. Top Sash Limiter
    - a. Available on all operator configurations, with the exception Single Hung configurations. This includes StormPlus IZ3
    - b. Standard application is factory applied. Available for field applications
    - c. Color: Will align with the Exterior Weather Strip Package selection

SECTION 085200

WOOD WINDOWS

G. Exterior Sash Lugs – Standard Option

1. Standard Profile: Ogee
2. Available on Top Sash
3. Color: Available in all exterior clad color options
  - a. Color shall be the same as top sash clad color
4. Standard application is factory applied. Available for field applications

**2.8 Weather Strip**

A. Operating units:

1. Jamb: Foam-filled bulb
2. Head jamb: Continuous dual leaf
3. Bottom rail: Hollow bulb

B. Stationary units:

1. Jamb: Foam-filled bulb
2. Head jamb: Hollow bulb
3. Bottom rail: Hollow bulb

**2.9 Jamb Extension**

- A. Jamb extensions as required.
- B. Finish: Match interior frame finish.

**2.10 Insect Screen**

- A. Factory-installed full or half screen: None
- B. Aluminum frame finish:
  1. Color: Matches exterior aluminum clad color.

**2.11 Simulated Divided Lites (SDL)**

## SECTION 085200

### WOOD WINDOWS

- A. 7/8" (22mm) wide, with internal spacer bar.
- B. Exterior muntins: 0.050" (1.3mm) thick extruded aluminum.
- C. Interior muntins: Vertical Grain Douglas Fir.
- D. Muntins adhere to glass with closed-cell copolymer acrylic foam tape.
- E. Exterior Sticking: Putty
- F. Interior Sticking:
  - 1. Standard: Ogee
- G. Patterns: rectangular
- H. Finish – exterior matched exterior clad colors, interior matches' interior wood species and color.

#### 2.12 Accessories and Trim

- A. Installation Accessories:
  - 1. Factory installed vinyl nailing/drip cap.
- B. Installation brackets: 6 3/8" (162mm), 9 3/8" (283mm), 15 3/8" (390mm)
- C. Masonry brackets: 6" (152mm), 10" (254mm)
- D. Aluminum Extrusions:
  - 1. Historic profiles as shown on drawings: Brick mold casing, jamb extender, mullion cover, and mullion expander, subsills, subsill end cap and lineal cap as required. See Drawings.
- E. Finish: Fluoropolymer modified acrylic topcoat applied over primer. Meets or exceeds AAMA 2605 requirements. Finish to be available in all exterior clad colors.

### Part 3 Execution

#### 3.1 Examination

## SECTION 085200

### WOOD WINDOWS

- A. Verification of Condition: Before installation, verify openings are plumb, square and of proper dimensions as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General contractor before proceeding.
- B. Acceptance of Condition: Beginning on installation confirms acceptance of existing conditions.

### **3.2 Installation**

- A. Comply with Section 01 73 00.
- B. Assemble and install window/door unit(s) according to manufacturer's instruction and reviewed shop drawing.
- C. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07 92 00 Joint Sealants. Do not use expansive foam sealant.
- D. Install accessory items as required.
- E. Use finish nails to apply wood trim and mouldings.

### **3.3 Field Quality Control**

- A. Remove visible labels and adhesive residue according to manufacturer's instruction.

### **3.4 Cleaning**

- A. Remove visible labels and adhesive residue according to manufacturer's instruction.
- B. Leave windows and glass in a clean condition. Final cleaning as required in Section 01 74 00.

### **3.5 Protecting Installed Construction**

- A. Comply with Section 07 76 00.
- B. Protecting windows from damage by chemicals, solvents, paint or other construction operations that may cause damage.

End of Section

## SECTION 087100

### DOOR HARDWARE

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section "Hollow Metal Doors and Frames".
  - 2. Division 08 Section "Stainless Steel Doors and Frames".
  - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series.
  - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
  - 3. ANSI/UL 294 - Access Control System Units.
  - 4. UL 305 - Panic Hardware.
  - 5. ANSI/UL 437- Key Locks.

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
  - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
  - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.



1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  3. Review sequence of operation narratives for each unique access controlled opening.
  4. Review and finalize construction schedule and verify availability of materials.
  5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

#### 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

#### 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship

within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
  2. Faulty operation of the hardware.
  3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
1. Ten years for mortise locks and latches.
  2. Five years for exit hardware.
  3. Twenty five years for manual overhead door closer bodies.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

### 2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
    - a. Two Hinges: For doors with heights up to 60 inches.
    - b. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four Hinges: For doors with heights 91 to 120 inches.
    - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
  2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
  3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
  4. Hinge Options: Comply with the following:
    - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
  5. Manufacturers:
    - a. Hager Companies (HA).
    - b. McKinney (MK).
    - c. Stanley Hardware (ST).
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
1. Manufacturers:
    - a. Hager Companies (HA).
    - b. Pemko (PE).
    - c. Stanley Hardware (ST).

## 2.3 DOOR OPERATING TRIM

- A. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
3. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
4. Manufacturers:
  - a. Ives (IV).
  - b. Rockwood (RO).

## 2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
  1. Manufacturers:
    - a. dormakaba Best (BE).
    - b. No Substitution.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
  1. Threaded mortise cylinders with rings and cams to suit hardware application.
  2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
  4. Tubular deadlocks and other auxiliary locks.
  5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  6. Keyway: Match Facility Standard.
- C. Interchangeable Cores: Provide small format interchangeable cores as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
  1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
  2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  3. Existing System: Field verify and key cylinders to match Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
  1. Change Keys per Cylinder: Two (2)
  2. Master Keys (per Master Key Level/Group): Five (5).
  3. Construction Keys (where required): Ten (10).
- F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Where specified, provide status indicators with highly reflective color and wording for "locked/unlocked" or "vacant/occupied" with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1" x 0.6" with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.
2. Manufacturers:
  - a. Corbin Russwin Hardware (RU) - ML2000 Series.
  - b. dormakaba Best (BE) - 45H Series.
  - c. Sargent Manufacturing (SA) - 8200 Series.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.

1. Vertical Impact: Exceed 100 vertical impacts (20 times ANSI/BHMA A156.2 requirements).
2. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
3. Locks are to be non-handed and fully field reversible.
4. Manufacturers:
  - a. Corbin Russwin Hardware (RU) - CLX3300 Series.
  - b. dormakaba Best (BE) - 9K Series.
  - c. Sargent Manufacturing (SA) - 10X Line.

2.6 AUXILIARY LOCKS

A. Cylindrical Deadlocks: ANSI/BHMA A156.36 Grade 1 Certified Products Directory (CPD) listed deadlocks to fit standard ANSI 161 preparation and 1 3/8" to 1 3/4" thickness doors. Provide tapered collars to resist vandalism and 1" throw solid steel bolt with hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other locksets.

1. Manufacturers:
  - a. Corbin Russwin Hardware (RU) - DL3000 Series.
  - b. dormakaba Best (BE) - T Series.
  - c. Sargent Manufacturing (SA) - 480 Series.

## 2.7 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
  1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
  4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
  1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  2. Strikes for Bored Locks and Latches: BHMA A156.2.
  3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
  4. Dustproof Strikes: BHMA A156.16.

## 2.8 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
  1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
  2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
  3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
  4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
  6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
  7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
  8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
    - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    - b. Sargent Manufacturing (SA) - 80 Series.
    - c. dormakaba Precision (PR) - Apex 2000 Series.

## 2.9 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
  2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
  4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
  6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Manufacturers:
    - a. Corbin Russwin Hardware (RU) - DC8000 Series.
    - b. LCN Closers (LC) - 4040 Series.
    - c. Sargent Manufacturing (SA) - 351 Series.

## 2.10 ARCHITECTURAL TRIM

### A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
  - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
  - a. Ives (IV).
  - b. Rockwood (RO).



## 2.11 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  - 1. Manufacturers:
    - a. Ives (IV).
    - b. Rockwood (RO).
    - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
  - 1. Manufacturers:
    - a. Norton Rixson (RF).
    - b. Rockwood (RO).
    - c. Sargent Manufacturing (SA).

## 2.12 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies 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 UL-10C.
  - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
  - 1. National Guard Products (NG).
  - 2. Pemko (PE).
  - 3. Reese Enterprises, Inc. (RE).

## 2.13 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

## 2.14 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

### 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

- B. Wood Doors: Comply with ANSI/DHI A115-W series.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and 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 specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
  - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
  - 1. Quantities listed are for each pair of doors, or for each single door.
  - 2. The supplier is responsible for handing and sizing all products.
  - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
  - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:

1. MK - McKinney

2. PE - Pemko
3. SA - SARGENT
4. BE - BEST Access & Door Closers
5. RO - Rockwood
6. RF - Rixson

### Hardware Sets

#### Set: 1.0

Doors: 109.1, B13.1

2 Continuous Hinge	CFM_HD1 x Length Required		PE
1 Concealed Vert Rod Exit, Nightlatch	16 70 MD8610 106	US32D	SA
1 Concealed Vert Rod Exit, Exit Only	LD MD8610 EO	US32D	SA
2 Core	As Required to Match Facility Standard	626	BE
1 Pull	RM201 Mtg-Type 12XHD	US32D- 316	RO
1 Surface Closer	351 CPS	EN	SA
1 Threshold	273x224AFGT x Length Required x MSES25SS		PE
1 Gasketing	S773BL (Head & Jambs)		PE
1 Rain Guard	346C x Width of Frame Head		PE
2 Sweep	3452CNB x Length Required		PE
1 Astragal	29324CNB x Door Height		PE

#### Set: 2.0

Doors: 104.1

2 Continuous Hinge	CFM_HD1 x Length Required		PE
1 Removable Mullion	L980S / L980A (As Required) x Length Required	PC	SA
1 Rim Exit Device, Storeroom	16 70 8804 Less Pull	US32D	SA
1 Rim Exit Device, Exit Only	LD 8810 EO	US32D	SA
3 Core	As Required to Match Facility Standard	626	BE
1 Cylinder	70 980C1	US26D	SA
1 Pull	RM201 Mtg-Type 12XHD	US32D- 316	RO
2 Surface Closer	351 CPS	EN	SA
1 Threshold	273x224AFGT x Length Required x		PE

	MSES25SS		
1 Gasketing	S773BL (Head & Jambs)		PE
1 Rain Guard	346C x Width of Frame Head		PE
1 Gasketing	5110BL x Length Required		PE
2 Sweep	3452CNB x Length Required		PE

**Set: 3.0**

Doors: 204.3, B16.1

1 Continuous Hinge	CFM_HD1 x Length Required		PE
1 Rim Exit Device, Storeroom	16 70 8804 Less Pull	US32D	SA
2 Core	As Required to Match Facility Standard	626	BE
1 Pull	RM201 Mtg-Type 12XHD	US32D-316	RO
1 Surface Closer	351 CPS	EN	SA
1 Threshold	273x224AFGT x Length Required x MSES25SS		PE
1 Gasketing	S773BL (Head & Jambs)		PE
1 Rain Guard	346C x Width of Frame Head		PE
1 Sweep	3452CNB x Length Required		PE

**Set: 4.0**

Doors: 112.3

1 Continuous Hinge	CFM_HD1 x Length Required		PE
1 Rim Exit Device, Exit Only	LD 8810 EO	US32D	SA
1 Surface Closer	351 P10 / O	EN	SA
1 Wall Stop	406 / 409	US26D	RO
1 Threshold	273x224AFGT x Length Required x MSES25SS		PE
1 Gasketing	S773BL (Head & Jambs)		PE
1 Rain Guard	346C x Width of Frame Head		PE
1 Sweep	3452CNB x Length Required		PE

**Set: 5.0**

Doors: B12. 1

2 Hinge	T4A3386 [NRP]	US32D	MK
1 Deadbolt	70 485	US26D	SA
1 Flush Pull	94 x TORX	US32D	RO
1 Threshold	169A x Length Required x MSES25SS		PE

1 Gasketing	S773BL (Head & Jambs)	PE
1 Rain Guard	346C x Width of Frame Head	PE
1 Sweep	315CN x Length Required	PE

**Set: 6.0**

Doors: 112.1

6 Hinge	T4A3786 [NRP]	US26D	MK
1 Surface Vert Rod Exit, Classroom	16 70 NB8713 ETL	US32D	SA
1 Surface Vert Rod Exit, Exit Only	LD NB8710 EO	US32D	SA
2 Core	As Required to Match Facility Standard	626	BE
2 Surface Closer	351 CPS	EN	SA
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO
2 Silencer	608		RO

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 7.0**

Doors: 103.1, 104.2

3 Hinge	T4A3786 [NRP]	US26D	MK
1 Rim Exit Device, Classroom	16 70 8813 ETL	US32D	SA
1 Core	As Required to Match Facility Standard	626	BE
1 Surface Closer	351 CPS	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
3 Silencer	608		RO

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 8.0**

Doors: 112.2

3 Hinge	T4A3786 [NRP]	US26D	MK
1 Rim Exit Device, Classroom	12 70 8813 ETL	US32D	SA
1 Core	As Required to Match Facility	626	BE

	Standard		
1 Surface Closer	351 CPS	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Gasketing	S88BL (Head & Jambs)		PE

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 9.0**

Doors: 110.1

3 Hinge	T4A3786 [NRP]	US26D	MK
1 Rim Exit Device, Passage	12 8815 ETL	US32D	SA
1 Surface Closer	351 P10 / O	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US26D	RO
1 Gasketing	S88BL (Head & Jambs)		PE

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 10.0**

Doors: 204.1, 204.2

3 Hinge	T4A3786 [NRP]	US26D	MK
1 Rim Exit Device, Passage	12 8815 ETL	US32D	SA
1 Surf Overhead Stop	10-X36	630	RF
1 Surface Closer	351 P10 / O	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Gasketing	S88BL (Head & Jambs)		PE

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 11.0**

Doors: 203.1



3 Hinge	TA2714 [NRP]	US26D	MK
1 Storeroom/Closet Lock	70 10XG04 LL	US26D	SA
1 Core	As Required to Match Facility Standard	626	BE
1 Wall Stop	406 / 409	US26D	RO
1 Silencer	608		RO

**Set: 12.0**

Doors: 105B.1

3 Hinge	TA2714 [NRP]	US26D	MK
1 Storeroom/Closet Lock	70 10XG04 LL	US26D	SA
1 Core	As Required to Match Facility Standard	626	BE
1 Surf Overhead Stop	10-X36	630	RF
1 Surface Closer	351 P10 / O	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
3 Silencer	608		RO

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 13.0**

Doors: 108.1, 111.1

3 Hinge	TA2714 [NRP]	US26D	MK
1 Entry/Office Lock	70 10XG05 LL	US26D	SA
1 Core	As Required to Match Facility Standard	626	BE
1 Surf Overhead Stop	10-X36	630	RF
1 Surface Closer	351 P10 / O	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
3 Silencer	608		RO

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 14.0**

Doors: 107.1

3 Hinge	T4A3786 [NRP]	US26D	MK
1 Classroom Lock	70 10XG37 LL	US26D	SA
1 Core	As Required to Match Facility Standard	626	BE
1 Surface Closer	351 CPS	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
3 Silencer	608		RO

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 15.0**

Doors: 201.1

3 Hinge	TA2714 [NRP]	US26D	MK
1 Classroom Lock	70 10XG37 LL	US26D	SA
1 Core	As Required to Match Facility Standard	626	BE
1 Surf Overhead Stop	10-X36	630	RF
1 Surface Closer	351 P10 / O	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
3 Silencer	608		RO

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 16.0**

Doors: 201.2

3 Hinge	TA2714 [NRP]	US26D	MK
1 Classroom Lock	70 10XG37 LL	US26D	SA
1 Core	As Required to Match Facility Standard	626	BE
1 Surface Closer	351 P10 / O	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US26D	RO
1 Gasketing	S88BL (Head & Jambs)		PE

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 17.0**

Doors: 105A.1, 202.1

3 Hinge	TA2714 [NRP]	US26D	MK
1 Privacy Lock	V21 8265 LNL	US26D	SA
1 Surface Closer	351 P10 / O	EN	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US26D	RO
1 Gasketing	S88BL (Head & Jambs)		PE
1 Coat Hook	RM801	US26D	RO

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 18.0**

Doors: 101.1, 102.1

1 Hinge	T4A3786 [NRP]	US26D	MK
1 Pull Plate	BF 110x70C	US32D	RO
1 Push Plate	70C-RKW	US32D	RO
1 Surface Closer	351 P10 / O	EN	SA
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Wall Stop	406 / 409	US26D	RO
1 Silencer	608		RO

Notes:

Verify and coordinate scheduled hardware with existing conditions prior to ordering. Prepare existing frame and provide all filler plates and accessories required for proper installation and function of new hardware.

**Set: 19.0**

Doors: 105B.2, 108.2, 108.3, 111.2

1	Existing Hardware To Remain
---	-----------------------------

END OF SECTION 087100

SECTION 089119  
FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed extruded-aluminum louvers.

B. Related Requirements:

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

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.

C. Samples: For each type of metal finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For manufacturer's special warranties.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

## SECTION 089119

### FIXED LOUVERS

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

#### 1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication. Louver shall be sized to fit within a masonry opening that is equal to brick and mortar dimensions; the bricks shall not be cut in order to fit a pre-ordered louver size. If louver is to replace an existing louver, louver shall be sized to fit within existing masonry opening.

#### 1.7 WARRANTY

- A. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
  1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    - c. Cracking, peeling, or chipping.
  2. Warranty Period: Minimum five years from date of Substantial Completion.

## PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures are considered to act normal to the face of the building.
- B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width in accordance with AMCA 500-L.

## SECTION 089119

### FIXED LOUVERS

- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

#### 2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal Nondrainable-Blade Louver, Extruded Aluminum:
  - 1. Louver Depth: 4 inches.
  - 2. Blade Profile: Plain blade without center baffle.
  - 3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
  - 4. Mullion Type: Fully recessed.
  - 5. Louver Performance Ratings:
    - a. Free Area: Not less than 53% open for size indicated on drawings. Not less than 8.5 sq. ft. for 48-inch- wide by 48-inch- high louver.
    - b. Point of Beginning Water Penetration: Not less than 750 fpm.
    - c. Air Performance: Not more than 0.10-inch wg static pressure drop at 750-fpm free-area exhaust velocity.
  - 6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

#### 2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
  - 1. Screen Location for Fixed Louvers: Interior face.
  - 2. Screening Type: Bird screening.
- B. Secure screen frames to louver frames with stainless steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
  - 1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
  - 2. Finish: Same finish as louver frames to which louver screens are attached.
  - 3. Type: Non-rewirable, U-shaped frames.
- D. Louver Screening for Aluminum Louvers:
  - 1. Bird Screening, Aluminum: 1/2-inch- square mesh, 0.063-inch wire, expanded and flattened.

#### 2.5 BLANK-OFF PANELS

- A. Uninsulated Blank-Off Panels: Metal sheet attached to back of louver.
  - 1. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.

## SECTION 089119

### FIXED LOUVERS

2. Panel Finish: Same finish applied to louvers.

#### 2.6 MATERIALS

- A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
  1. Use hex-head or Phillips pan-head tamper-resistant screws for exposed fasteners unless otherwise indicated.
  2. For fastening aluminum, use aluminum or 300 series stainless steel fasteners.
  3. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless steel components, with allowable load or strength design capacities calculated in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing in accordance with ASTM E488/E488M conducted by a qualified testing agency.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

#### 2.7 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
  1. Frame Type: Channel unless otherwise indicated.
- C. Include supports, anchorages, and accessories required for complete assembly.
- D. Provide drain pan sills made of same material as louvers for recessed louvers.

#### 2.8 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. Baked-Enamel Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.



## SECTION 089119

### FIXED LOUVERS

1. Color and Gloss: As selected by Architect from manufacturer's full range of standard and custom colors.

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

##### 3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

##### 3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

##### 3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

SECTION 089119

FIXED LOUVERS

- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Non-load-bearing steel framing systems for interior partitions- full height and half height
- 2. Suspension systems for interior ceilings and soffits.
- 3. Mineral wool blanket acoustical insulation at restroom metal stud walls and suspended ceilings

- B. Related requirements:

- 1. Section 092900 Gypsum Board
- 2. Section 093013 Ceramic Tiling
- 3. MEP Requirements

#### 1.3 ACTION SUBMITTALS

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

- 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."
- 2. Mineral wool blanket insulation.

### 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: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, **G40 (Z120)**, hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or embossed steel studs and runners.
1. Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: 20 gauge **0.0329 inch (0.836 mm)** AND other gauges as noted on the drawings.
    - b. Depth: As indicated on Drawings.
  2. Embossed Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: **0.0190 inch (0.483 mm)**.
    - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing **1-1/2-inch (38-mm)** minimum vertical movement.
  2. Single Long-Leg Runner System: ASTM C 645 top runner with **2-inch- (51-mm-)** deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within **12 inches (305 mm)** of the top of studs to provide lateral bracing.
  3. Double-Runner System: ASTM C 645 top runners, inside runner with **2-inch- (51-mm-)** deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
  4. 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: 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.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: **0.0179 inch (0.455 mm)**

- F. Cold-Rolled Channel Bridging: Steel, **0.0538-inch (1.367-mm)** minimum base-metal thickness, with minimum **1/2-inch- (13-mm-)** wide flanges.
  - 1. Depth: As indicated on Drawings **1-1/2 inches (38 mm)**.
  - 2. Clip Angle: Not less than **1-1/2 by 1-1/2 inches (38 by 38 mm)**, **0.068-inch- (1.72-mm-)** thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
  - 1. Minimum Base-Metal Thickness: **0.0179 inch (0.455 mm)**.
  - 2. Depth: As indicated on Drawings
- H. Resilient Furring Channels: **1/2-inch- (13-mm-)** deep, steel sheet members designed to reduce sound transmission.
  - 1. Configuration: Asymmetrical or hat shaped.
- I. Cold-Rolled Furring Channels: **0.053-inch (1.34-mm)** uncoated-steel thickness, with minimum **1/2-inch- (13-mm-)** wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of **0.0329 inch (0.8 mm)**.
  - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.062-inch- (1.59-mm)** diameter wire, or double strand of **0.048-inch- (1.21-mm-)** diameter wire.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of **1-1/4 inches (32 mm)**, wall attachment flange of **7/8 inch (22 mm)**, minimum uncoated-metal thickness of **0.0179 inch (0.455 mm)**, and depth required to fit insulation thickness indicated.

## 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.062-inch- (1.59-mm-)** diameter wire, or double strand of **0.048-inch- (1.21-mm-)** diameter wire.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.16 inch (4.12 mm)** in diameter.
- C. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of **0.0538 inch (1.367 mm)** and minimum **1/2-inch- (13-mm-)** wide flanges.
  - 1. Depth: [**1-1/2 inches (38 mm)**].
- D. Furring Channels (Furring Members):
  - 1. Cold-Rolled Channels: **0.0538-inch (1.367-mm)** uncoated-steel thickness, with minimum **1/2-inch- (13-mm-)** wide flanges, **3/4 inch (19 mm)** deep.

## 2.4 MINERAL-WOOL BLANKET INSULATION

1. Basis-of-Design Product: Subject to compliance with requirements, provide Johns Manville; a Berkshire Hathaway company; MinWool Sound Attenuation Fire Batt or a comparable product by one of the following:
  - a. Owens Corning.
  - b. ROCKWOOL.
2. Surface burning characteristics – ASTM E84: Maximum flame spread: 0, Maximum smoke spread: 0
3. Combustion characteristics - ASTM E136 Noncombustible: Pass
4. Fungi resistance characteristics – ASTM C1338: Pass

## 2.5 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 (3.2 mm)** thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

### 3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
  2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
  3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
  4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
  2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
  3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts 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 (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  4. Sound-Rated Partitions: Install framing to comply with sound-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 (610 mm)** 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 (610 mm)** 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 (610 mm)** 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 (305 mm)** from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than **1/8 inch (3 mm)** from the plane formed by faces of adjacent framing.

### 3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: **48 inches (1219 mm)** o.c.
  2. Carrying Channels (Main Rimmers): **48 inches (1219mm)** o.c.
  3. Furring Channels (Furring Members): **16 inches (406 mm)** o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system



members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

- a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Installation Tolerances: Install suspension systems that are level to within **1/8 inch in 12 feet (3 mm in 3.6 m)** measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

### 3.6 INSTALLING MINERAL WOOL BLANKET INSULATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.
- F. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
- G. Maintain **3-inch (76-mm)** clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

- H. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

### 3.7 PROTECTION AND CLEANING

- A. Protect materials from damage during installation and subsequent construction.
- B. Repair or replace damaged products before Substantial Completion.

END OF SECTION 092216

## SECTION 092613

### GYPSUM VENEER PLASTERING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Gypsum veneer plaster on gypsum board or magnesium board substrates.

###### B. Related Requirements:

1. Section 061053 "Miscellaneous Carpentry" for wood framing, furring and blacking that supports gypsum veneer plaster assemblies.
2. Section 092216 "Non-Structural Metal Framing" for non-load-bearing steel framing and acoustical insulation blanket.
3. Section 092900 "Gypsum Board" for gypsum base for plaster finishes.

##### 1.2 ACTION SUBMITTALS

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

###### B. Shop Drawings:

1. Show locations, fabrication, and installation of control joints, reveals, and trim; include plans, elevations, sections, details of components, and attachments to other work.

###### C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 10-inch (250-mm) length for each trim accessory.

##### 1.3 MOCKUPS

###### A. Provide a full-thickness finish mockup for each type and finish of gypsum veneer plaster and substrate to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select representative surfaces and conditions for application of each type of gypsum veneer plaster and substrate.
2. Provide mockups of ceilings and partitions in sizes of at least 100 sq. ft. (9 sq. m).
3. Apply gypsum veneer plaster, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## SECTION 092613

### GYPSUM VENEER PLASTERING

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover, and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.
- C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C843 requirements or gypsum veneer plaster manufacturer's written recommendations, whichever are more stringent.
- B. Room Temperatures: Maintain not less than 55 deg F (13 deg C) or more than 80 deg F (27 deg C) for seven days before application of gypsum base and gypsum veneer plaster, continuously during application, and after application until veneer plaster is dry.
- C. Avoid conditions that result in gypsum veneer plaster drying too rapidly.
  - 1. Distribute heat evenly; prevent concentrated or uneven heat on veneer plaster.
  - 2. Maintain relative humidity levels, for prevailing ambient temperature, that produce normal drying conditions.
  - 3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during veneer plaster application until it is dry.
- D. Do not install panels that are wet, moisture damaged, mold damaged, or faded from overexposure to sunlight.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### PART 2 - PRODUCTS

#### 2.1 SOURCE LIMITATIONS

- A. Obtain gypsum veneer plaster products, including gypsum base for veneer plaster, joint reinforcing tape, and embedding material, from single manufacturer.

#### 2.2 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 E119 by an independent testing agency.

## SECTION 092613

### GYPSUM VENEER PLASTERING

#### 2.3 GYPSUM VENEER PLASTER

- A. Two-Component Gypsum Veneer Plaster: ASTM C587, with separate formulations; one for base-coat application and one for finish-coat application over substrates.
  - 1. Base Coat 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. USG Corporation.
    - b. National Gypsum Company, Gold Bond.
  - 2. Smooth Finish Coat 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. USG Corporation.
    - b. National Gypsum Company, Gold Bond.

#### 2.4 TRIM ACCESSORIES

- A. Standard Trim: ASTM C1047, provided or approved by manufacturer for use in gypsum veneer plaster applications indicated.
  - 1. Material: Galvanized-steel sheet or aluminum-coated steel sheet; rolled zinc, plastic, or paper-faced galvanized-steel sheet.
  - 2. Shapes:
    - a. Cornerbead.
    - b. Bullnose bead.
    - c. LC-Bead: J-shaped; exposed long flange receives veneer plaster.
    - d. L-Bead: L-shaped; exposed long flange receives veneer plaster.
    - e. U-Bead: J-shaped; exposed short flange does not receive veneer plaster.
    - f. Curved-Edge Cornerbead: With notched or flexible flanges.
    - g. Control joints.

#### 2.5 JOINT-REINFORCING MATERIALS

- A. General: Comply with joint strength requirements in ASTM C587 and with gypsum veneer plaster manufacturer's written recommendations for each application indicated.
- B. Joint Tape:
  - 1. Gypsum Base for Veneer Plaster: As recommended by gypsum veneer plaster manufacturer for applications indicated.
  - 2. Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.
- C. Embedding Material for Joint Tape:

## SECTION 092613

### GYPSUM VENEER PLASTERING

1. Gypsum Base for Veneer Plaster: As recommended by gypsum veneer plaster manufacturer for use with joint-tape material and gypsum veneer plaster applications indicated.
2. Cementitious Backer Units: As recommended by cementitious backer unit manufacturer for applications indicated.

#### 2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.
- B. Bonding Agent: ASTM C631 polyvinyl acetate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
  1. Use screws complying with ASTM C954 for fastening panels to steel members from **0.033 to 0.112 inch (0.84 to 2.84 mm)** thick.
- D. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- E. Sound Attenuation Blankets: As specified in
- F. Acoustical Joint Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
- G. Patching Mortar: Dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a **No. 16 (1.18-mm)** sieve, using only enough water for handling and placing.

### 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 panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Masonry Substrates: Verify that mortar joints are struck flush.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION OF PANEL PRODUCTS

- A. Gypsum Base for Veneer Plaster: Apply according to ASTM C844 unless manufacturer's written recommendations are more stringent.

## SECTION 092613

### GYPSUM VENEER PLASTERING

1. Do not allow gypsum base to degrade from exposure to sunlight, as evidenced by fading of paper facing.
  2. Erection Tolerance: No more than **1/16-inch (1.6-mm)** offsets between planes of gypsum base panels, and **1/8 inch in 8 feet (3 mm in 2.4 m)** noncumulative, for level, plumb, warp, and bow.
- B. Install sound attenuation blankets before installing gypsum base for veneer plaster.
- C. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch (1.6 mm)** of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not locate joints, other than control joints, at corners of framed openings.
- F. Attach panels to steel studs, so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach panels to framing provided at openings and cutouts.
- H. Form control joints with space between edges of adjoining panels.
- I. Cover both sides of partition framing with panels in concealed spaces, including above ceilings, except in internally braced chases.
1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft. (0.74 sq. m)** in area.
  2. Fit panels around ducts, pipes, and conduits.
  3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut panels to fit profile formed by coffers, joists, and other structural members; allow **1/4- to 3/8-inch- (6.4- to 9.5-mm-)** wide joints; seal joints with acoustical sealant.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Fastener Spacing: Comply with ASTM C844, manufacturer's written recommendations, and fire-resistance-rating requirements.
1. Space screws a maximum of **12 inches (305 mm)** o.c. along framing members for wall or ceiling application.

## SECTION 092613

### GYPSUM VENEER PLASTERING

- L. Install panels for veneer plaster in locations indicated on Drawings.
  - M. Single-Layer Application:
    - 1. On ceilings, apply gypsum base panels before wall panels, to the greatest extent possible and at right angles to framing unless otherwise indicated.
    - 2. On walls, apply gypsum base panels vertically and parallel to framing unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - 3. On Z-furring, apply gypsum base panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  - N. Multilayer Application on Ceilings: Apply backing panels for ceilings before applying backing panels for partitions; apply gypsum-base face layers in same sequence. Apply backing panels at right angles to framing members and offset gypsum-base, face-layer joints a minimum of **16 inches (400 mm)** from parallel backing panel joints unless otherwise required by fire-resistance-rated assembly.
  - O. Multilayer Application on Partitions: Apply backing panels indicated and gypsum-base face layers vertically (parallel to framing), with joints of backing panels located over stud or furring members and gypsum-base, face-layer joints offset at least one stud or furring member from backing-panel joints, unless otherwise required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
    - 1. Z-Furring: Apply backing panels vertically (parallel to framing) and gypsum-base face layer either vertically or horizontally (perpendicular to framing), with vertical joints offset at least one furring member. Locate edge joints of backing panels over furring members.
  - P. Fasteners: Drive fasteners flush with gypsum base surface. Do not overdrive fasteners or cause surface depressions.
  - Q. Single-Layer Fastening Methods: Apply gypsum base panels to supports with steel drill screws.
  - R. Multilayer Fastening Methods: Fasten backing panels and gypsum-base face layers separately to supports with screws.
  - S. Curved Surfaces: Comply with gypsum base manufacturer's written installation recommendations.
- 3.3 INSTALLATION OF TRIM ACCESSORIES
- A. General: Install trim with back flanges intended for fasteners, and attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.



## SECTION 092613

### GYPSUM VENEER PLASTERING

- B. Control Joints: Install according to ASTM C844 and in specific locations approved by Architect.
- C. Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners.
  - 2. LC-Bead: J-shaped; exposed long flange received joint compound
  - 3. Curved-Edge Cornerbead: Use at curved openings.

#### 3.4 INSTALLATION OF JOINT REINFORCEMENT

- A. Gypsum Base: Reinforce interior angles and flat joints with joint tape and embedding material to comply with ASTM C843 and with gypsum veneer plaster manufacturer's written recommendations.
- B. Magnesium Oxide Board Base: Install Magnesium Oxide Board per manufacturer's written instructions.

#### 3.5 APPLICATION OF GYPSUM VENEER PLASTER

- A. Bonding Agent: Apply bonding agent on dry abuse-resistant base panels according to gypsum veneer plaster manufacturer's written recommendations.
- B. Gypsum Veneer Plaster Mixing: Mechanically mix gypsum veneer plaster materials to comply with ASTM C843 and with gypsum veneer plaster manufacturer's written recommendations.
- C. Gypsum Veneer Plaster Application: Comply with ASTM C843 and with veneer plaster manufacturer's written recommendations.
  - 1. Two-Component Gypsum Veneer Plaster:
    - a. Base Coat: Hand trowel or machine apply base coat over substrate to a uniform thickness of **1/16 to 3/32 inch (1.6 to 2.4 mm)**. Fill voids and imperfections.
    - b. Finish Coat: Trowel apply finish-coat plaster over base-coat plaster to a uniform thickness of **1/16 to 3/32 inch (1.6 to 2.4 mm)**.
  - 2. Where gypsum veneer plaster abuts metal, including doorframes, windows and other units, groove finish coat to eliminate spalling.
  - 3. Do not apply veneer plaster to gypsum base if paper facing has degraded from exposure to sunlight. Before applying veneer plaster, use remedial methods to restore bonding capability to degraded paper facing according to manufacturer's written recommendations.
- D. Concealed Surfaces: Do not omit gypsum veneer plaster behind cabinets, furniture, furnishings, and similar removable items. Omit veneer plaster in the following areas where it will be concealed from view in the completed Work unless otherwise indicated or required to maintain fire-resistance and STC ratings:
  - 1. Above suspended ceilings.

SECTION 092613

GYPSUM VENEER PLASTERING

2. Behind wood paneling.

E. Gypsum Veneer Plaster Finish: Smooth-troweled finish unless otherwise indicated.

3.6 PROTECTION

A. Protect installed gypsum veneer plaster from damage from weather, condensation, construction, and other causes during remainder of the construction period.

B. Remove and replace gypsum veneer plaster and gypsum base panels that are wet, moisture damaged, or mold damaged.

1. Indications that gypsum base panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.

2. Indications that gypsum base panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092613

SECTION 092900

GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Interior gypsum board.

B. Related Requirements:

- 1. Section 079200 "Joint Sealants" for joint sealants installed in gypsum board assemblies.
- 2. Section 092216 "Non-Structural Metal Framing" for insulation within interior partitions and non-structural steel framing and suspension systems that support gypsum board panel.
- 3. Section 092613 "Gypsum Veneer Plastering" for gypsum-veneer-plaster finishes.
- 4. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.
- 5. Section 099123 "Interior Painting" for painting of interior GWB and plaster.
- 6. Section 124816 "Entrance Floor Grilles" for cement board underlayment for installation of recessed floor grilles.

1.3 ACTION SUBMITTALS

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

B. Samples: For the following products:

- 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

C. Samples for Initial Selection: For each type of trim accessory indicated.

D. Samples for Verification: For the following products:

- 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

## SECTION 092900

### GYPSUM BOARD

#### 1.4 MOCKUPS

- A. Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
  - 1. Build mockups for the following:
    - a. Each level of gypsum board finish indicated for use in exposed locations.
  - 2. Apply or install final decoration indicated, including painting and plastering, on exposed surfaces for review of mockups.
  - 3. Simulate finished lighting conditions for review of mockups.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### PART 2 - PRODUCTS

#### 2.1 SOURCE LIMITATIONS

- A. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.

SECTION 092900

GYPSUM BOARD

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 Board, Type X: ASTM C 1396/C 1396M.

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. USG Corporation.
  - b. CertainTeed Corporation.
  - c. Georgia-Pacific Gypsum LLC.
2. Thickness: 5/8 inch (15.9 mm).
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

- A. Impact-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.

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. USG Corporation.
  - b. CertainTeed Corporation.
  - c. Georgia-Pacific Gypsum LLC.
2. Core: 5/8 inch (15.9 mm), Type X.
3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
6. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 requirements according to test in Annex A1.
7. Long Edges: Tapered.
8. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

- B. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

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. **USG Corporation.**

## SECTION 092900

### GYPSUM BOARD

- b. CertainTeed Corporation.
- c. Georgia-Pacific Gypsum LLC.
2. Core: 5/8 inch (15.9 mm), Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

#### 2.4 TRIM ACCESSORIES

##### A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
  - a. Cornerbead.
  - b. Bullnose bead.
  - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
  - d. Expansion (control) joint.

#### 2.5 JOINT TREATMENT MATERIALS

##### A. General: Comply with ASTM C 475/C 475M.

##### B. Joint Tape:

1. Interior Gypsum Board: Paper.

##### 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 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 setting-type, sandable topping compound.
6. Cementitious Backer Units: As recommended by backer unit manufacturer.
7. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

## SECTION 092900

### GYPSUM BOARD

#### 2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from **0.033 to 0.112 inch (0.84 to 2.84 mm)** thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

##### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch (1.5 mm)** of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.

## SECTION 092900

### GYPSUM BOARD

- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft. (0.7 sq. m)** in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow **1/4- to 3/8-inch- (6.4- to 9.5-mm-)** wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide **1/4- to 1/2-inch- (6.4- to 12.7-mm-)** wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Type X: Ceilings
  - 2. Impact Resistant Type: Walls
  - 3. Mold-Resistant Type: Toilet 105A ceiling
- B. Single-Layer Application:
  - 1. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  - 2. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.



## SECTION 092900

### GYPSUM BOARD

#### 3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners unless otherwise indicated.
  - 2. Bullnose Bead: Use at outside corners.
  - 3. LC-Bead: Use at exposed panel edges.

#### 3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 5: All locations of gypsum wall board.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

#### 3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

SECTION 092900

GYPSUM BOARD

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013

CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazed wall tile.
2. Thresholds.
3. Tile backing panels.
4. Metal transition and edge protection strips.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 124816 "Entrance Floor Grilles" for cement board underlayment for installation of recessed floor grilles.

1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Face Size: Actual tile size, excluding spacer lugs.
- C. Module Size: Actual tile size plus joint width indicated.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. Samples for Verification:
1. Full-size units of each type and composition of tile and for each color and finish required.
  2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
  3. Full-size units of each type of trim for each color and finish required.

SECTION 093013

CERAMIC TILING

4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of product.
- C. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer
- D. Product Test Reports: For tile-setting and -grouting products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
  1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
  2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
  3. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  1. Build mockup of each type of wall tile installation.
  2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

SECTION 093013

CERAMIC TILING

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
  - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
  - 1. Stone thresholds.
  - 2. Cementitious backer units.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

SECTION 093013

CERAMIC TILING

2.3 TILE PRODUCTS

- A. Glazed Wall Tile Types, CT-2, CT-3, CT-4, CT-5, CT-6, CT-7, CT-8, CT-9, CT-10, CT-11, CT-12, CT-13:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Daltile® Color Wheel Classic or comparable product by one of the following:
    - a. American Olean; a brand of Dal-Tile Corporation.
    - b. Bedrosian Tile and Stone.
    - c. Seneca Tiles, Inc.
  2. Module Size: As follows, with types corresponding with designations on Drawings:
    - a. CT-2: 1 by 6 inches (24 by 152 mm)
    - b. CT-3: 3 by 6 inches (76 by 152 mm)
    - c. CT-4: 3 by 6 inches (76 by 152 mm)
    - d. CT-5: 3 by 6 inches (76 by 152 mm)
    - e. CT-6: 6 by 6 inches (152 by 152 mm)
    - f. CT-7: 6 by 6 inches (152 by 152 mm)
    - g. CT-8: 3 by 6 inches (76 by 152 mm)
    - h. CT-9: 3 by 6 inches (76 by 152 mm)
    - i. CT-10: 6 by 6 inches (152 by 152 mm)
    - j. CT-11: 3 by 6 inches (76 by 152 mm)
    - k. CT-12: 3 by 6 inches (76 by 152 mm)
    - l. CT-13: 6 by 6 inches (152 by 152 mm)
  3. Face Size Variation: Rectified.
  4. Thickness: 5/16 inch.
  5. Face: Pattern of design indicated, with manufacturer's standard edges.
  6. Finish: Semimat, opaque glaze.
  7. Tile Color and Pattern: As indicated by manufacturer's designations below,
    - a. CT-2, CT-3, CT-6: Artic White 0190 (1)
    - b. CT-4, CT-7: Plum Crazy 1178 (3)
    - c. CT-5: Urban Putty 0761 (2)
    - d. CT-8, CT-10: Sea Breeze, 1174 (3)
    - e. CT-9: Matte Gray 0709 (2)
    - f. CT-11, CT-13: Ocean Blue, 1049 (3)
    - g. CT-12: Spa 0148 (3)
  8. Grout Color: As selected by Architect from manufacturer's full range.
  9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    - a. CT-2 Wainscot Trim: Quarter Round, A-106

## SECTION 093013

### CERAMIC TILING

#### 2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
  - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of [10] [12] according to ASTM C1353 or ASTM C241/C241M and with honed finish.
  - 1. Description:
    - a. Uniform, fine- to medium-grained white stone with gray veining.

#### 2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 or ASTM C1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation Durock® Brand Cement Board with EdgeGuard™ or comparable product by one of the following:
    - a. Custom Building Products.
    - b. Georgia-Pacific Gypsum LLC.
  - 2. Thickness: 5/8 inch (15.9 mm).
  - 3. Board Length: 8 feet (2438 mm).
  - 4. Board Width: 48 inches (1219 mm).
  - 5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
  - 6. Minimum bending radius: **6 feet**.
  - 7. Fastener Requirements: Provide fasteners of size and type indicated that comply with requirements specified for material and application.
    - a. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: DUROCK Brand Steel or USG Sheathing SF steel drill screws 1-1/4 inch, 1-5/8 inch, 2-1/4 inch with corrosion-resistant coating.
    - b. Wood Screws: DUROCK Brand Wood or USG Sheathing WF screws 1-1/4 inch, 1-5/8 inch, 2-1/4 inch with corrosion-resistant coating.
    - c. Nails: 11-gauge hot-dipped galvanized roofing nails 1-1/2 inch 1-3/4 inch , **7/16** inch diameter head.

#### 2.6 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.

SECTION 093013

CERAMIC TILING

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Custom Building Products. Versa Bond Mortar.
  - b. LATICRETE. 253 Gold.
  - c. MAPEI Corporation. Ultraflex 2.
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. High-Performance Tile Grout: ANSI A118.7. To be used at all wall tile installations.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide Custom Building Products ; Prism® Ultimate Performance Grout. or a comparable product by one of the following:
    - a. Laticrete International, Inc.
    - b. MAPEI Corporation.

2.8 SEALANT

- A. Interior sealant and caulk at horizontal and vertical control and expansion joints in the ceramic tile installation are to match the grout color of the adjacent tile.
- B. Sealant and caulk used in adjacent to the tile installation to be supplied by the same manufacturer as the grout to assure a perfect match.

2.9 MISCELLANEOUS MATERIALS

- A. Metal Transition and Edge-Protection Strips, TR-1, TR-2: Cove, L-shaped, height to match tile and setting-bed thickness, metallic designed specifically for flooring and wall applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide Schluter Systems L.P.; Schluter – Dilex-HKU (TR-1), Schluter – Quadec (TR-2), or a comparable product by one of the following:
    - a. Blanke Corporation.
    - b. Ceramic Tool Company, Inc.



## SECTION 093013

### CERAMIC TILING

- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

#### 2.10 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION OF CERAMIC TILE

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

## SECTION 093013

### CERAMIC TILING

- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
  - D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
  - E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
  - F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
    - 1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
    - 2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
  - G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
    - 1. Glazed Wall Tile: 1/16 inch.
  - H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
  - I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
    - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
  - J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
    - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in modified dry-set mortar (thinset).
  - K. Metal Edge Strips: Install at locations indicated.
- 3.3 INSTALLATION OF TILE BACKING PANELS
- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

## SECTION 093013

### CERAMIC TILING

#### 3.4 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

#### 3.5 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

#### 3.6 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations, Metal Studs or Furring:
  - 1. TCNA W244C or TCNA W244F: Thinset mortar on cementitious backer units or fiber-cement backer board.
    - a. Ceramic Tile Type: CT-2, CT-3, CT-4, CT-5, CT-6, CT-7, CT-8, CT-9, CT-10, CT-11, CT-12, CT-13
    - b. Thinset Mortar: Modified dry-set mortar.
    - c. Grout: High-performance unsanded grout.

END OF SECTION 093013

SECTION 095113

ACOUSTICAL PANEL CEILINGS

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Related Requirements:
  - 1. Section 095426 "Suspended Wood Ceilings" for ceilings consisting of suspended acoustical wood panels.
- C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For components with factory-applied finishes.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
  - 1. Acoustical Panels: Set of ~~6-inch-~~ (150-mm-) square Samples of each type, color, pattern, and texture.
  - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of ~~6-inch-~~ (150-mm-) long Samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Ceiling suspension-system members.
  - 2. Structural members to which suspension systems will be attached.
  - 3. Method of attaching hangers to building structure.

SECTION 095113

ACOUSTICAL PANEL CEILINGS

- a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
  4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
  5. Size and location of initial access modules for acoustical panels.
  6. Items penetrating finished ceiling and ceiling-mounted items including the following:
    - a. Lighting fixtures.
    - b. Diffusers.
    - c. Grilles.
    - d. Speakers.
    - e. Access panels.
    - f. Perimeter moldings.
  7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
  8. Minimum Drawing Scale: **1/4 inch = 1 foot (1:48)**.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockup of typical ceiling area as shown on Drawings.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage

## SECTION 095113

### ACOUSTICAL PANEL CEILINGS

from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

#### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

#### 1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace acoustical ceiling panels that fail in materials or factory workmanship resulting in sagging or warping within specified warranty period.
  - 1. Warranty Period: 10 years from date of installation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Class A according to ASTM E1264.
  - 2. Smoke-Developed Index: 50 or less.

#### 2.3 ACOUSTICAL PANELS, ACP-1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall Solutions, Calla®, Item Number 2820 or comparable product by one of the following:
  - 1. Armstrong Ceiling & Wall Solutions.
  - 2. Certainteed; SAINT-GOBAIN.
  - 3. USG Corporation.

## SECTION 095113

### ACOUSTICAL PANEL CEILINGS

- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
  - 1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted.
  - 2. Pattern: E (lightly textured).
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.85.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.85.
- H. Articulation Class (AC): Not less than 170.
- I. Edge/Joint Detail: Square.
- J. Thickness: 1 inch (25 mm).
- K. Modular Size: 24 by 24 inches (610 by 610 mm).
- L. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

#### 2.4 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall Solutions, Suprafine ® or comparable product by one of the following:
  - 1. Armstrong Ceiling & Wall Solutions.
  - 2. Certainteed; SAINT-GOBAIN.
  - 3. USG Corporation.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
- C. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 (Z90) coating designation; with prefinished 9/16-inch- (15-mm-) wide metal caps on flanges.
  - 1. Structural Classification: Heavy-duty system.
  - 2. End Condition of Cross Runners: butt-edge type.

## SECTION 095113

### ACOUSTICAL PANEL CEILINGS

3. Face Design: Flat, flush.
4. Cap Material: Cold-rolled steel or aluminum.
5. Cap Finish: Painted white.

#### 2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
  1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
  2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than **0.106-inch- (2.69-mm-)** diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

#### 2.6 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
  1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
  1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
  2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of **1.5 mils (0.04 mm)**. Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.



SECTION 095113

ACOUSTICAL PANEL CEILINGS

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M, seismic design requirements, and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

## SECTION 095113

### ACOUSTICAL PANEL CEILINGS

5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  6. Do not support ceilings directly from permanent metal forms or floor deck.
  7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  8. Do not attach hangers to steel deck tabs.
  9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  10. Space hangers not more than **48 inches (1200 mm)** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches (200 mm)** from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than **16 inches (400 mm)** o.c. and not more than **3 inches (75 mm)** from ends. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
  2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  3. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
  4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

### 3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

SECTION 095113

ACOUSTICAL PANEL CEILINGS

- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 095426

WOOD VENEER ACOUSTIC CEILING PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general conditions of the contract, including general and supplementary conditions and division 1 specification sections, apply to the work of this section.

1.2 SUMMARY

- A. Section includes:
  - 1. Sound absorptive panels
- B. Related sections
  - 1. Section 092613 Gypsum Veneer Plaster
  - 2. Section 092900– Gypsum and Panel Board

1.3 SUBMITTALS

- A. Comply with Section 013300 – Submittal Procedures
- B. Product Data: Manufacturer's technical data and installation instructions for each type of ceiling panel required.
- C. Certifications: Certified test reports showing compliance with performance requirements specified.
- D. Samples: Submit a minimum of three (3) samples of each panel type and finish type required. Include samples that show the range of variation expected in grain, texture and color.
- E. Shop Drawings: Submit shop drawings, including details, for all ceilings. Coordinate ceiling panel layout, installation and suspension system components. Show overall layout with dimensions and details of penetrations and intersections with other materials or building components.
- F. Full range of manufacturer's standard veneers and finishes for selection.
- G. Submit operation and maintenance data for installed products. Include precautions relating to harmful cleaning materials and methods that would affect the service life of the panels.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide acoustic panels from a single manufacturer with at least 5 years of prior experience fabricating projects of similar size and complexity.

## SECTION 095426

### WOOD VENEER ACOUSTIC CEILING PANELS

- B. Installer: Installation shall be done by qualified carpenters with at least 2 years of experience in the installation of architectural woodwork or acoustical ceilings. Installers must receive training on handling, cutting, machining and field finishing the specified product prior to receiving materials on site.
- C. Fire Performance Characteristics: Class A as tested by an independent accredited testing facility. Tests: ASTM E84. Flame spread: 25 or less. Smoke developed: 450 or less as specified by state or local codes.
- D. Coordination of Work: Installing contractor shall organize and conduct a pre-installation survey of temperature, humidity and construction elements attaching, penetrating or concealed behind the acoustic ceiling panels.

#### 1.5 REFERENCES

##### A. Test Methods:

1. ASTM C423 Sound absorption and sound absorption coefficients by the reverberation room method performed by an independent testing agency
2. ASTM E84 Standard test method for surface burning characteristics of building materials
3. ASTM D1037 Linear expansion with change in moisture content

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver panels to the project in original, unopened packages. Inspect containers for visible damage and report any questionable condition to the shipper and manufacturer immediately.
- B. Store products in a fully enclosed, clean, dry space out of direct sunlight and protected from damage with temperature controlled between 50 and 86 degrees F.
- C. Handle products carefully to avoid damaging panel surfaces or chipping edges. Report any damage immediately. Installation of damaged panels is not covered by the manufacturer's warranty.

#### 1.7 PROJECT CONDITIONS

- A. Do not install acoustic ceiling panels until space is enclosed and weather-proofed, wet work is completely dry and ambient temperature and humidity conditions are maintained at the levels indicated for the project when occupied for its intended use.
- B. Permit panels to reach room temperature, 50 to 86 degrees F, and stabilized moisture content of 25% to 55% RH for at least 72 hours before installation per AWI standards. Building should be enclosed and HVAC systems functioning in continuous operation with relative humidity maintained between 25 and 55 percent.

#### 1.8 WARRANTY

SECTION 095426

WOOD VENEER ACOUSTIC CEILING PANELS

- A. Provide manufacturer's standard one-year written product warranty per Section 01770 – Closeout Procedures
- B. Manufacturer's warranty is limited to decorative or acoustical panel materials only. Other components used in the ceiling system are excluded. Refer to the appropriate provisions in the related specification section.

1.9 MAINTENANCE

- A. Maintenance Instructions: Provide manufacturers, standard maintenance and cleaning instructions for finishes provided.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: SOUNDPLY® Alta CP-LRM-25 (1") thick Ceiling Panels for Interior Installation, as manufactured by Navy Island Inc., 275 Marie Avenue E, St. Paul, MN 55118, Ph. (651) 451-4454, email [sales@navyisland.com](mailto:sales@navyisland.com)

2.2 MATERIALS

- A. Real wood veneer laminated to a fiberglass reinforced polymer. Surface skin thickness shall not be less than 1.5mm (0.060"). The core of the panels shall be comprised of a Class A mineral wool.
- B. Panel Edge Treatment: Panels will be edge banded with the matching materials and finish.
- C. Panel Mounting: Select Panels to be mounted per manufacturer's installation instructions for open reveal 1/8" or 1/4" closed reveal with recessed spline in matching wood and finish.
- D. Panel Weight: Approx 1.8 lbs./ft<sup>2</sup>
- E. Panel Sizes: As shown on drawings.
- F. Panel Thickness: 1" or as required to meet equivalent acoustic performance.
- G. Flame Resistance: Class 1 (A) rating based on ASTM E84 standard test method for surface burning characteristics in building materials.
- H. Perforations: Panels will be furnished with perforated faces consisting of 0.5mm (0.02") diameter holes in an offset pattern. The perforations must be clean without rounded edges or grain pull out between perforations. A minimum of 99.5% of the perforations must be acoustically functional, providing unobstructed passage into the core. Perforations must maintain consistent diameter through the face material and backer with no tapering or roughness.

## SECTION 095426

### WOOD VENEER ACOUSTIC CEILING PANELS

- I. Acoustic Performance: To generate the standing sound waves required for resistive absorption, each panel must have an acoustically reflective back surface that extends the panel's full length and width. Each panel must achieve a minimum NRC test value as stated without any cavity space or back loading:
  - 0.80 NRC
- J. Ceiling Attenuation Class: To prevent airborne sound transmission through shared ceiling plenums, each installed panel (lay-in or torsion spring) must have a minimum CAC value = 39+ CAC
- K. Panel Stability: Linear contraction or expansion not to exceed 0.4% maximum variation in width or height per ASTM D1037.
- L. Finish for Veneer Faced Panels:
  - 1. Species as selected by the architect.
  - 2. Cut: *quartered/rift*
  - 3. Matching veneer leaves: *random match*
  - 4. Matching between panels: *natural sequence*
  - 5. Finishes shall be applied in the shop: *clear and/or stained*.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Inspect installation area and conditions under which work is to be performed for compliance with all manufacturer's environmental requirements. All wet work in the installation area must be complete, cured and dry prior to installation. Do not proceed until all unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Installation must be done by qualified carpenters with 2 years of experience in the installation of architectural woodwork or acoustic ceilings. The firm must demonstrate successful experience installing materials of similar type and quality of those required for this project. The use of proper carpentry tools and techniques will be required for the installation.
- B. Comply with manufacturer's instruction and recommendations for hanging panels.
  - 1. Direct mount, install using Z-clips and ceiling-mounted Z-bars.
- C. Confirm all field dimensions are coordinated with shop drawings.

PROJ. NO. 16228E-03-01

095426-4

WOOD VENEER ACOUSTIC CEILING PANELS

SECTION 095426

WOOD VENEER ACOUSTIC CEILING PANELS

3.3 ADJUSTING AND CLEANING

- A. Clean soiled surfaces of panels per manufacturer's instructions.
- B. Remove and replace damaged or discolored materials not in compliance with manufacturer's tolerances.

-END -



SECTION 096400

WOOD FLOORING, TREADS AND RISERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Field-finished wood flooring, including patching, repair and replacement of existing wood floors.
2. Field-finished treads and risers.

B. Related Requirements:

1. Section 064023 "Interior Architectural Woodwork" for interior wood trims, stair moldings and railings.
2. Section 099300 "Staining and Transparent Finishing" for finishing of wood floors and stairs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. For patching, repair and replacement: Provide scaled drawings as basis of unit price quantities.

C. Samples: For each exposed product and for each color and texture specified, finished to match surrounding existing floors.

1.3 QUALITY ASSURANCE

A. Finish samples to be approved in the field.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hardwood Flooring: Comply with NWFA A500 for species, grade, and cut.

1. Certification: Provide flooring that carries NWFA grade stamp on each bundle or piece.

B. Maple Flooring: Comply with applicable MFMA grading rules for species, grade, and cut.

1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.

C. Softwood Flooring: Comply with WCLIB No. 17 grading rules for species, grade, and cut.

SECTION 096400

WOOD FLOORING, TREADS AND RISERS

2.2 FIELD-FINISHED WOOD FLOORING

- A. Solid-Wood Flooring, Field-Finished: Kiln dried to 6 to 9 percent maximum moisture content; tongue and groove and end matched; with backs channeled.
  - 1. Grade and Species: Clear red oak, No. 2 Common red oak, MFMA-RL First Grade hard maple, heart-wood pine or match existing.
  - 2. Cut: Cut to match existing. Assume quarter sawn as basis of unit prices.
  - 3. Thickness: Match existing or as indicated on Drawings.
  - 4. Face Width: 2-1/4 inches (57 mm) or to match existing.
  - 5. Treads and Risers: Solid material as required and indicated on Drawings.
  - 6. Lengths: Random-length strips complying with applicable grading rules.
  
- B. Urethane Finish System: Complete water-based system of compatible components that is recommended by finish manufacturer for application indicated.
  - 1. Stain: Penetrating and nonfading type.
    - a. Color: As required to match color of surrounding existing floor.
  - 2. Floor Sealer: See Section 099300 "Staining and Transparent Finishing".
  - 3. Finish Coats: See Section 099300 "Staining and Transparent Finishing".
  
- C. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

2.3 ACCESSORY MATERIALS

- A. Wood Subfloor (if required): Solid, tongue and groove decking, thickness to match existing, kiln-dried Southern Yellow Pine or equal.
  
- B. Asphalt-Saturated Felt: ASTM D4869/D4869M, Type II.
  
- C. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines."
  
- D. Thresholds and Saddles: To match wood flooring. Tapered on each side. Utilize product that meets ADA/ ANSI 117.1 requirements.
  
- E. Reducer Strips: To match wood flooring. Tapered, and in thickness required to match height of flooring. Utilize product that meets ADA/ ANSI 117.1 requirements.

SECTION 096400

WOOD FLOORING, TREADS AND RISERS

PART 3 - EXECUTION

3.1 PREPARATION

- A. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines."
- B. Wood Subfloor: Install according to requirements in Section 061000 "Rough Carpentry" and Section 061600 "Sheathing." Infill area to center at supporting framing. Remove tongue elements only as required.
- C. Solid-Wood Flooring: Blind nail or staple flooring to substrate.
- D. Stairs:
  - 1. Install stairs with treads and risers no more than 1/8 inch (3 mm) from indicated position.
  - 2. Secure with countersunk, concealed fasteners and blind nailing.
  - 3. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with wood surface.

3.3 FIELD FINISHING

- A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that are noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.
  - 1. Comply with applicable recommendations in NWFA's "Installation Guidelines."
- B. Fill and repair wood flooring defects.
- C. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.
  - 1. Apply stains to achieve an even color distribution matching approved Samples.
  - 2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.
- D. Cover wood flooring before finishing.
- E. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

SECTION 096400

WOOD FLOORING, TREADS AND RISERS

3.4 PROTECTION

- A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
  - 1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

SECTION 096519

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Resilient floor tile.
  - 2. Resilient wall base.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient floor tile.
  - 1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 2. Show details of special patterns.
- C. Samples for Initial Selection: For each type of floor tile and base indicated.
- F. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- G. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

## SECTION 096519

### RESILIENT TILE FLOORING

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

#### 1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

#### 1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

#### 1.10 WARRANTY

A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

SECTION 096519

RESILIENT TILE FLOORING

- B. Limited Warranty Period: 5 years

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
  - 2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less

2.2 RESILIENT FLOOR TILE MATERIALS

- A. Manufacturers: Basis of Design provide products by Armstrong Flooring, Inc.
  - 1. Other manufactures subject to compliance with requirements, products by one of the following manufacturers may be submitted under the provisions of Division 01, Substitution Procedures.
- B. Basis of Design: Striations BBT and Migrations BBT Bio-Flooring manufactured by Armstrong.
  - 1. Description: Tile composed of polyester resin binder, fillers and pigments with colors and pattern dispersed uniformly throughout its thickness.
  - 2. Bio-flooring tile shall conform to the requirements of ASTM F 2982 Standard Specification for Polyester Composition Floor Tile. Note: Striations BBT™ and Migrations® BBT™ Bio- flooring's unique binder system does not contain polyvinyl chloride resins and plasticizers.
  - 3. Size: 12 in. x 12 in. or 12 in. x 24 in., refer to drawings
  - 4. Thickness: 1/8"/0.125 in. (3.2mm)
- C. Colors and Patterns: to be selected from manufacturer's color options and per floor patterns shown in drawings.

2.3 WALL BASE MATERIALS

- A. For top set wall base: Provide 1/8 in. thick, 6 in. high Armstrong Flooring Color-Integrated Wall Base with a matte finish, conforming to ASTM F 1861, Type TP - Rubber, Thermoplastic, Group 1 - Solid, Style B – Cove.
- B. Colors and Patterns: to be selected from manufacturer's color options.

## SECTION 096519

### RESILIENT TILE FLOORING

#### 2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
  - 1. Adhesive shall have a VOC content of 50 g/L or less.
- C. Provide transition/reducing strips tapered to meet abutting materials.

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Examine substrates, with Installer and the Manufacturer's Representative present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

##### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
  - 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.



## SECTION 096519

### RESILIENT TILE FLOORING

- a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
  - b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum **75** percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
- 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floortile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- 1. Lay tiles in pattern indicated on drawings.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- 1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

## SECTION 096519

### RESILIENT TILE FLOORING

#### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floortile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
  - 4. Apply 3 to 5 coats of high-quality commercial floor polish, such as Armstrong Flooring S-480 Commercial Floor Polish. If the floor has already been stripped (due to construction traffic), the application of a stain resistant sealer (such as Armstrong Flooring S-495 Commercial Floor Sealer) prior to the application of polish, is recommended in areas that will be exposed to heavy traffic and/or staining agents.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.
- E. Manufacturer's Field Representation to include providing cleaning and maintenance training and demonstration to Philadelphia Parks and Recreation Department's staff. Manufacturer's Representative to confirm in writing that the installation meets manufacturer's installation and cleaning recommendations at completion

END OF SECTION

SECTION 096750

URETHANE CEMENT COMPOSITION FLOORING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes all labor, materials, equipment and services necessary to complete the installation of:

1. Seamless flooring system applied over existing tile and wood floor.
  - a. Decorative urethane mortar with colored quartz broadcast aggregate.
  - b. Polyaspartic topcoat
2. Acrylic cement underlayment for installation on existing wood and tile substrates.

- B. Related Requirements:

1. Section 093012 "Ceramic Tiling" for ceramic tile and metal transition strips.
2. Division 15- floor drains and clean outs

1.3 PREINSTALLATION MEETING

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

1. Review methods and procedures related to flooring installation including, but not limited to, the following:
  - a. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
  - b. Review installation details and suitable location for installation of mock-up.
  - c. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.04 ACTION SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Submit manufacturer's technical data, application instructions and general recommendations for the urethane cement composition flooring specified herein.

## SECTION 096750

### URETHANE CEMENT COMPOSITION FLOORING

- D. Samples for initial selection showing the full range of colors including decorative quartz available.
  - 1. Submit 2-1/2" x 4" samples in custom color as selection shall be designated by the Architect.
- E. Samples for Verification: For each resinous flooring system or color specified, provide 3 each, 6 inches (150mm) square samples in the selected color and texture. Submit samples with quick glaze sealer in both glossy and satin finish. Each sample shall be applied to a ridged backing by the installing contractor for this project. Label each sample with the manufacturer's body, mix and aggregate type, sizes, proportion and glaze finish.

#### 1.5 INFORMATIONAL SUBMITTALS

- F. Material certificates signed by manufacturer certifying that the urethane cement composition flooring supplied for the project complies with requirements specified herein.
- G. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.
- H. Contractor Certification: Submit a letter from the primary materials manufacturer certifying that the installing contractor has been properly trained in the application of the materials being installed, is acceptable to the materials manufacturer, with a record of successful in-service performance.
  - 1. Engage an installer who employs only persons trained and approved by the resinous flooring manufacturer for applying resinous flooring systems specified.
  - 2. Engage an installer who is certified in writing by the resinous flooring manufacturer as a factory trained applicator qualified to apply the specified resinous flooring system.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer or applicator that has specialized in installing resinous flooring types similar to that required for this Project and who is acceptable to manufacturer of primary materials.
- B. Single-Source Responsibility: Obtain urethane cement composition flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer. Provide secondary materials, including patching and fill materials, joint sealant, accessory items, and repair materials. Of a type and from a source recommended by the manufacturer of the primary materials
- D. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set the standard of quality for materials and installation.

Mock-up to be installed on a separately constructed base model to replicates existing conditions. At a minimum the mock-up sample shall be 5 foot x 5 foot with a tile substrate to match the existing floor and include two sides of an interior corner. The installation is to ensure that there will be no telegraphing of the tile grouts lines and to

## SECTION 096750

### URETHANE CEMENT COMPOSITION FLOORING

demonstrate the finish cove base, joint detailing, interior corner, terminations and any other special conditions. Apply all components of the specified resinous flooring system at the specified thickness and finished in the texture and color as selected. Application to simulate the actual installation characteristics.

1. Simulate finished lighting conditions for Architects review of mockups.

#### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.
- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

#### 1.8 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with urethane cement composition flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect Work.
- B. Lighting: Permanent lighting or fully illuminated conditions must be in place and working before installing resinous flooring.
- C. Close spaces to traffic during urethane cement flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis of Design, subject to compliance with requirements, provide the following products as manufactured by Crossfield Products Corp. in Rancho Dominguez, California and Roselle Park or comparable product by another manufacturer.

1. Underlayment: Dex-O-Tex A-81 Underlayment
2. Urethane Concrete Flooring: Dex-O-Tex Tek-Crete SL-CQ
3. Polyaspartic Topcoat: Dex-O-Tex Quik- Glaze

#### 2.2 UNDERLAYMENT

PROJ. NO. 16228E-03-01

096750-3

URETHANE CEMENT COMPOSITION FLOORING

## SECTION 096750

### URETHANE CEMENT COMPOSITION FLOORING

- A. Polymer modified, pre-packaged cementitious sloping, leveling and patching compound with a wire reinforcing mesh, installed at a nominal 1/8" – 3/16" thickness.

1. Physical Properties:

- a. VOC in g/L (40 CFR 60): 0 g/L
- b. Compressive Strength (ASTM C307): 4,140psi.
- c. Tensile Strength (ASTM C307): 800 psi.
- d. Flexural Strength (ASTM C580): 1,200 psi.
- e. Hardness (ASTM D2240, Shore D): 70-75
- f. Water Absorption (MIL-D-3134): 3.14%

### 2.3 URETHANE CONCRETE FLOORING

- A. Troweled Urethane Cement Composition Flooring with Decorative Color Quartz Broadcast:

2. Physical Properties:

- g. Compressive Strength (ASTM C579): 6,100 psi (42.0 MPa).
- h. Thermal Distortion (250 degrees F Emersion): Passes.
- i. Tensile Strength (ASTM C307): 1,000 psi (6.89 MPa).
- j. Flexural Strength (ASTM C580): 2,000 psi (13.8 MPa).
- k. Thermal Co-Efficient of Thermal Expansion (ASTM C531): 1.4 x 10E5.
- l. Density (ASTM C905): 130 pcf (20.4 kN/cu.m).
- m. Water Absorption (MIL-PRF-3134): 0.64 percent.
- n. Surface Hardness (ASTM D2240) 85-90 Durometer "D".
- o. Abrasion Resistance (ASTM D1044): 33mg.
- p. Adhesion (ASTM D4541): 400 psi (2.76 MPa), 100 percent failure in concrete.
- q. Flammability-Critical Radiant Flux (ASTM E648): 1.07 watts/sq.cm.
- r. Resistance to Fungal Growth (ASTM G21): Passes, Rating 1.

3. Colors: As indicated, or if not otherwise indicated, custom grey color as selected by Architect from manufacturer's standard colors.
4. Body Coat: 3/16 to 1/4 inch (5 to 6 mm) thick with colored quartz broadcast.
5. Top Coat: Clear gloss, UV and abrasion resistant, high build Polyaspartic.

- B. Polyaspartic Topcoat: Sealing or finish coats, 95 percent solids formulation.

1. Types: Clear type and pigmented type, as indicated or directed.
2. Finish: Matte.
3. Number of Coats: One.
4. Physical Properties: Provide products with the following minimum physical property requirements when tested according to test methods indicated:
  - a. Tear Strength: 879 lbs/in. according to ASTM D 624, Die C.
  - b. Tensile Strength: 2,400 psi minimum according to ASTM D 412.
  - c. Hardness: 85-90, Shore D according to ASTM D 2240.
  - d. UV stable.

## SECTION 096750

### URETHANE CEMENT COMPOSITION FLOORING

- C. Anti-Microbial Additive: Sealing or finish coats, 95 percent solids formulation.

#### PART 3 - EXECUTION

##### 3.1 INSPECTION

- A. Examine the areas and conditions where the urethane cement composition flooring is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

##### 3.2 PREPARATION

- A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.
- B. Wooden Subfloor: Mechanically prepare the surface via sanding as required to obtain optimum bond of flooring to substrate. Remove sufficient material to provide a sound surface, free of laitance and any bond-inhibiting agents.
- C. Existing Tiled Surfaces: Shot-blast, patch grout lines or power scarify as required to obtain optimum bond of flooring and base to substrate and to assure no telescoping of substrate through to the finished product. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents and to assure no telescoping of substrate through to finished product. Remove grease, oil, and other penetrating contaminate. Prepare substrate in accordance with SSPC SP 13. Leave surface free of dust, dirt, laitance, and efflorescence.
- D. Underlayment: Over the prepared substrate, staple down 1/8" galvanized diamond mesh, overlapping the seams 1". Apply the acrylic cement according to the manufacturer's written instructions, covering the mesh in its entirety, leaving a smooth surface.
- E. Materials: Mix resin hardener and aggregate as required, and prepare materials according to flooring system manufacturer's instructions.

##### 3.3 APPLICATION

- A. General: Apply each component of urethane cement composition flooring system according to manufacturer's directions to produce a uniform monolithic flooring surface of thickness indicated.
- B. Body Coat: Over prepared surface, Screed mortar mix at nominal 3/16" – 1/4"-inch thickness as specified. Allow material flow out and begin to settle. Back roll with a spike roller or looped roller as appropriate to distribute material to a smooth even finish.
- C. Broadcast Aggregate: Broadcast selected colored quartz aggregate blend into the wet Body Coat. Apply to an even distribution and texture, allow to cure.
- D. Remove Excess Aggregate: Remove all loose or unsound colored quartz aggregate from the cured

## SECTION 096750

### URETHANE CEMENT COMPOSITION FLOORING

surface. Vacuum up all dust and fine particles from the surface, remove any ridge lines and detail all imperfection in the textured surface.

- E. Finish or Sealing Coats: After quartz filled broadcast coats have cured sufficiently, apply finish coats of type recommended by flooring manufacturer to produce finish matching approved submittal sample and in number of coats and spreading rates recommended by manufacturer. Finished floor shall be a nominal 3/16" – 1/4" thick.

#### 3.4 CURING, PROTECTION AND CLEANING

- A. Cure urethane cement composition flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 96 hours.

END OF SECTION 096750



SECTION 099113

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:

- 1. Existing roof level galvanized / steel mechanical equipment.
- 2. Existing miscellaneous pre-finished aluminum substrates.
- 3. Existing window/ door lintels.
- 4. Existing ornamental iron stair railings

- B. Section includes surface preparation and the application of anti-graffiti coatings on the following exterior substrates:

- 1. Existing brick, stone and cast stone masonry walls.
- 2. Existing concrete cheek walls.

- C. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
- 2. Section 055100 "Metal Stairs" for shop priming metal stairs.
- 3. Section 099300 "Staining and Transparent Finishing" for surface preparation and application of wood stains and transparent finishes on exterior wood substrates.

1.3 ACTION SUBMITTALS

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

- 1. Include preparation requirements and application instructions.
- 2. Indicate VOC content.

- B. Samples for Initial Selection: For each type of topcoat product.

- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

- 1. Label each coat of each Sample.
- 2. Label each Sample for location and application area.

- D. Product Schedule: Use same designations indicated on Drawings and in the Exterior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

SECTION 099113

EXTERIOR PAINTING

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

SECTION 099113

EXTERIOR PAINTING

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 PAINT PRODUCTS, 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 topcoat manufacturer for use in paint system and on substrate indicated.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.

1. Flat Paints and Coatings: 50 g/L
2. Nonflat Paints and Coatings: 150 g/L
3. Primers, Sealers and Undercoaters: 200 g/L
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L
5. Zinc-rich Industrial Maintenance Primers: 340 g/L

C. Colors: As selected by Architect from manufacturer's full range.

2.3 ANTI-GRAFFITI COATINGS

- A. Semi-gloss, clear, one-component, non-sacrificial, ready-to-use siloxane coating that cures with atmospheric moisture.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.

1. Anti-graffiti coatings: 250 g/L

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. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers.

- C. Proceed with coating application only after unsatisfactory conditions have been corrected.

## SECTION 099113

### EXTERIOR PAINTING

1. Application of coating indicates acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems specified in this Section.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
  1. SSPC-SP 3.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove loose surface oxidation.

#### 3.3 INSTALLATION

- A. Apply paints in accordance with manufacturer's written instructions.
  1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  3. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  4. Primers specified in the Exterior Painting Schedule may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.

## SECTION 099113

### EXTERIOR PAINTING

- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  - 1. Paint the following work where exposed to view:
    - a. Equipment, including panelboards and switch gear.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.

#### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

#### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
  - 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
  - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
  - 3. Allow empty paint cans to dry before disposal.
  - 4. Collect waste paint by type and deliver to recycling or collection facility.

SECTION 099113

EXTERIOR PAINTING

- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Steel Lintel Substrates:
  - 1. Protective & Marine Coating: Sherwin Williams
    - a. Prime Coat: organic zinc-rich epoxy primer, Zinc Clad 4100.
    - b. Intermediate Coat: Matching topcoat.
    - c. Topcoat: Hi-solids Polyurethane, semigloss.
- B. Iron Railing Substrates:
  - 1. Sherwin Williams:
    - a. Primer: S-W Kem Bond Alkyd Primer
    - b. Intermediate Coat: S-W Bond Plex Waterbased Acrylic Coating, low gloss
    - c. Finish Coat: S-W Bond Plex Waterbased Acrylic Coating, low gloss
- C. Galvanized-Steel Substrates:
  - 1. Protective Steel Coating: Andek (800-800-2844)
    - a. Primer / Sealer: Andek Polaprime 21 solvent-based, single component polyurethane primer.
    - b. Base Coating: Andek Polarroof RAC single-component urethane.
    - c. Protective Coat 1: Andek Wearcoat 44 solvent-based cyclo-aliphatic urethane
  - 2. Alternate Protective Steel Coating: Sherwin Williams
    - a. Primer: MacroPoxy 646 @ 5.0-10 .0 mils dft
    - b. Intermediate Coat: Acrolon 218 Polyurethane @ 3.0-5.0 mils dft
    - c. Finish Coat: Acrolon 218 Polyurethane @ 3.0-5.0 mils dft
- D. Aluminum Substrates:
  - 1. Sherwin Williams:
    - a. Prime Coat: ProIndustrial Pro-Cryl Universal Primer.
    - b. Intermediate Coat: DTM Acrylic, Semi-gloss
    - c. Topcoat: DTM Acrylic, Semi-gloss.
- E. Ferrous Metal – miscellaneous
  - 1. Sherwin Williams:
    - a. Primer: S-W Kem Bond Alkyd Primer
    - b. Intermediate Coat: S-W Bond Plex Waterbased Acrylic Coating, low gloss
    - c. Finish Coat: S-W Bond Plex Waterbased Acrylic Coating, low gloss

SECTION 099113

EXTERIOR PAINTING

Alternate Anti-graffiti finish coats.

- d. Intermediate Coat: S-W 2K Waterbased Anti-Graffiti Coating, satin finish
- e. Finish Coat: S-W 2K Waterbased Anti-Graffiti coating, satin finish.

3.7 EXTERIOR ANTI-GRAFFITI COATING SCHEDULE

A. Concrete Substrates:

- 1. Sherwin Williams:
  - a. 1K Siloxane Coating, semi-gloss finish

B. Masonry Substrates:

- 1. Sherwin Williams:
  - a. Base Coat: 1K Siloxane Coating, semi-gloss finish – reduced 10%
  - b. Top Coat: 1K Siloxane Coating, semi-gloss finish

END OF SECTION 099113

SECTION 099123

INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Gypsum board, plaster, or magnesium oxide board.
  - 2. Wood.
  - 3. Miscellaneous Metal.
- B. Related Requirements:
  - 1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
  - 2. Section 092900 "Gypsum Board" for surface preparation and application of paint on interior gypsum board surfaces.
  - 3. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.
  - 4. Section 099600 "High-Performance Coatings" for tile-like coatings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include preparation requirements and application instructions.
  - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
  - 1. Label each coat of each Sample.
  - 2. Label each Sample for location and application area.
- D. Product Schedule: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.



SECTION 099123

INTERIOR PAINTING

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

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.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

SECTION 099123

INTERIOR PAINTING

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. Benjamin Moore & Co.
  - 2. Pratt & Lambert.
  - 3. Sherwin-Williams Company (The) >
- B. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 PAINT PRODUCTS, GENERAL

- A. Material Compatibility:
  - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
  - 1. Flat Paints and Coatings: 50 g/L
  - 2. Nonflat Paints and Coatings: 150 g/L
  - 3. Primers, Sealers and Undercoaters: 200 g/L
  - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L
  - 5. Zinc-rich Industrial Maintenance Primers: 340 g/L
- C. Colors: As indicated in a finish schedule.

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. Masonry (Clay and CMUs): 12 percent.
  - 2. Wood: 15 percent.
  - 3. Gypsum Board: 12 percent.
  - 4. Plaster: 12 percent.

SECTION 099123

INTERIOR PAINTING

- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer. but not less than the following:
  - 1. SSPC-SP 3.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove loose surface oxidation.
- H. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.

## SECTION 099123

### INTERIOR PAINTING

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- I. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

### 3.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions.
  1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  1. Paint the following work where exposed in occupied spaces, including store room and utility room:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - h. Other items as directed by Architect.

## SECTION 099123

### INTERIOR PAINTING

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

#### 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
  1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
  2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
  3. Allow empty paint cans to dry before disposal.
  4. Collect waste paint by type and deliver to recycling or collection facility.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

#### 3.5 INTERIOR PAINTING SCHEDULE

- A. Miscellaneous Metal Substrates:
  1. Institutional Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer, rust-inhibitive, water based MPI #107 unless otherwise indicated.  
Basis of Design: SW Pro Industrial Pro-Cryl Universal Primer
      - 1) Shop primer specified in Section 051200 "Structural Steel Framing" where substrate is specified.
    - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.  
Basis of Design: SW Pro Industrial Acrylic Semi-Gloss
- B. Wood Substrates for Painted Finish: Including stair trim, wood paneling and window/ door trims.

SECTION 099123

INTERIOR PAINTING

1. Institutional Low-Odor/VOC Latex System:
  - a. Prime Coat: Primer, latex, for interior wood, MPI #39.  
Basis of Design: SW Multipurpose Latex Primer/Sealer
  - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.  
Basis of Design: SW Pro Industrial Acrylic Semi Gloss
  - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.  
Basis of Design: SW Pro Industrial Acrylic Semi Gloss
  
- C. Gypsum Board/ Plaster/ Magnesium Oxide Board Substrates:
  1. Institutional Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.  
Basis of Design: SW Promar 200 Zero VOC Latex Primer
    - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.  
Basis of Design: SW Promar 200 Zero VOC Latex
    - c. Topcoat for Ceilings and Soffits: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1), MPI #143.  
Basis of Design: SW Promar 200 Zero VOC Latex Flat
    - d. Topcoat for Walls, Typical Locations: Latex, interior, institutional low odor/VOC, eggshell (Gloss Level 3), MPI #145.  
Basis of Design: SW Promar 200 Zero VOC Latex Eggshell
    - e. Topcoat for Walls, Moisture Locations, Storage Rooms and Closets: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.  
Basis of Design: SW Promar 200 Zero VOC Latex Semi-Gloss
      - 1) Moisture locations include toilet rooms and janitor or custodial closets.
  
- D. Insulation-Covering Substrates: Including pipe and duct coverings.
  1. Institutional Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer sealer, latex, interior, MPI #50.  
Basis of Design: SW Promar 200 Zero VOC Latex Primer
    - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.  
Basis of Design: SW Promar 200 Zero VOC Latex Semi-Gloss
    - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
    - d. Basis of Design: SW Promar 200 Zero VOC Latex Semi-Gloss

END OF SECTION 099123

SECTION 099300

STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Surface preparation and application of wood finishes on the following substrates:
  - 1. Interior substrates: Wood floors, stairs and treads.
- B. Related Requirements:
  - 1. Section 096400 "Wood Flooring, Treads and Risers" for patching/ repair/ replacement of existing wood floors and stairs.

1.2 ACTION SUBMITTALS

- A. Product Data:
  - 1. For each type of product.
  - 2. Include preparation requirements and application instructions.
  - 3. Indicate VOC content.
- B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.
- C. Samples for Verification: Sample for each type of finish system and in each color and gloss of finish required on representative samples of actual wood substrates.
  - 1. Size: Minimum 8 inches square or 8 inches long.
  - 2. Apply coats on Samples in steps to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Trained in application of the manufacturer's floor products.

1.4 MOCKUPS

- A. Apply mockups of each finish system indicated and each color selected to demonstrate aesthetic effects and to set quality standards for materials and execution.

## SECTION 099300

### STAINING AND TRANSPARENT FINISHING

1. The Professional will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
  - a. Continuous Surfaces: Provide samples of at least 96 inches in length by full width and depth of each member.
  - b. Other Items: The Professional will designate items or areas required.
2. Final approval of stain color selections will be based on mockups.
  - a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste from storage areas daily.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction

#### 1.6 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 65 and 80 deg F.
- B. Do not apply finishes when relative humidity exceeds 70 percent, at temperatures of less than 5 deg F above the dew point, or to damp or wet surfaces.
- C. 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 limits.
- D. Do not apply exterior finishes in snow, rain, fog, or mist.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide Bona US, Traffic HD Anti-Slip, or comparable product by one of the following:



SECTION 099300

STAINING AND TRANSPARENT FINISHING

- a. Benjamin Moore & Co.
- b. PPG Paints; PPG Industries, Inc.
- c. Sherwin-Williams Company (The).

2.2 SOURCE LIMITATIONS

- A. Source Limitations: Obtain each coating product from single source from single manufacturer.

2.3 MATERIALS, GENERAL

- A. Material Compatibility:
  1. Provide materials for use within each coating 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.
- B. Stain Colors: As selected by Architect from manufacturer's full range.

2.4 WATERBORNE FINISHES

- A. Commercial Anti-Slip Satin Finish:
  1. Ingredients: Water, polymeric resin, dipropylene glycol monomethyl ether, and amorphous silica.
  2. Color: Milky white (wet).
  3. Clarity: Clear and colorless when dry.
  4. pH: 7.5 to 7.9.
  5. Solids: 34 percent (with hardener).
  6. Density: 8.70 lbs per gal (1.04 s.g.).
  7. US Regulatory VOC Compliant: 230 g/L.
  8. Coefficient of Friction: Greater than 0.8.
  9. Gloss Level (60 degrees): Approximately 25 percent.
  10. Odor: Non-offending, slight ammonia.
  11. Stability: 1-year shelf life in unopened container.
  12. Cure Time: 100 percent after 7 days
  13. Meets ADA recommendation for accessible routes and ramps according to ASTM D2047.

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 Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.

## SECTION 099300

### STAINING AND TRANSPARENT FINISHING

- C. Wood Subfloor:
  - 1. For moisture content and quality of substrates, the guidelines of the wood floor manufacturer shall be followed.
    - a. Wood Subfloor Moisture Content: 20 percent maximum.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Building climate control system shall be functioning with a temperature of 65 to 80 degrees F (18.3 to 26.7 degrees C) and maximum relative humidity of 70 percent for 72 hours before flooring is installed, during installation, and for 72 hours after installation. Acclimate flooring according to manufacturer's instructions.
- F. Proceed with finish application only after unsatisfactory conditions have been corrected.
  - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION

- A. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
  - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- B. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
  - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
  - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- C. Interior Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Apply wood filler paste to open-grain woods to produce smooth, glasslike finish.
  - 3. Sand surfaces exposed to view and dust off.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.
- D. Sanding and preparation of new floors:
  - 1. Sand and prepare floor using accepted industry association methods.

## SECTION 099300

### STAINING AND TRANSPARENT FINISHING

2. Vacuum thoroughly.
3. Stained Floors: Buff the floor with 80 to 100 grit paper. Then use a Bona MultiDisc or similar product with 80 to 120 grit paper.
4. Unstained Floors: Buff the floor with 80 to 120 grit paper. Then use a Bona MultiDisc or similar product with 120 to 150 grit paper. This burnishing will reduce the amount of grain raise.
5. Use a natural fiber bristle brush on a buffer and vacuum thoroughly.
6. Tack with a dry Microfiber Tacking Pad or cloth to remove dust.
7. Apply finish system.

#### 3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions.
  1. Use applicators and techniques suited for finish and substrate indicated.
  2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
  3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

#### 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.
- E. After application, protect floor finish from damage during subsequent work.
- F. Do not allow foot traffic until floor is sufficiently dried and cured.

#### 3.5 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood Substrates, Traffic Surfaces, Including Floors and Stairs:
  1. Clear, Two-Component Waterborne System:

SECTION 099300

STAINING AND TRANSPARENT FINISHING

- a. Prime Coat: Waterborne varnish matching topcoat.
- b. Intermediate Coat: Waterborne varnish matching topcoat.
- c. Topcoat: Varnish, waterborne, clear, satin.

END OF SECTION 099300

## SECTION 101423.16

### ROOM-IDENTIFICATION PANEL SIGNAGE

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.

##### 1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standards listed below.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification 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 other installers, 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 for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
  - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
  - 1. Room-Identification Signs: Full-size Sample.
  - 2. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
  - 3. Exposed Accessories: Full-size Sample of each accessory type.

4. Full-size Samples, if approved, will be returned to Contractor for use in Project.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

### 2.2 ROOM-IDENTIFICATION SIGNS

- A. 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. Sign-Panel Perimeter: Finish edges smooth.
    - a. Edge Condition: Square cut.
    - b. Corner Condition in Elevation: Rounded to radius per manufacturer standards.
  2. Mounting: Manufacturer's standard method for substrates indicated. Surface mounted to wall with two-face tape.
  3. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.
  4. Background Color: As selected by Architect from manufacturer's full range of standard and custom colors.

### 2.3 SIGN MATERIALS

- A. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

### 2.4 ACCESSORIES

- A. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
- B. Adhesive may be added to the back of heavy or larger signs if the two-sided tape does not seem sufficient. Adhesive caulk recommended by manufacturer is preferred, but clear silicone may be used, if approved by sign manufacturer.

## 2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 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.
  - 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. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.
  - 1. ADA tactile signs are to be placed in a range where the braille is between a minimum of 48" above finish floor to the bottom of the lowest characters and a maximum of 60" above finished floor to the highest tactile character.
  - 2. Signs should be mounted on the wall on the latch side of the door. If there is no room on that wall, the sign may be mounted on the nearest adjacent wall. Refer to plans.
  - 3. Double doors signs shall be mounted adjacent to the inactive leaf or to the right of the right-handed door.
- C. 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.
  - 2. Adhesive: may be added to the back of heavy or larger signs if the two-sided tape does not seem sufficient. Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

### 3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423.16



SECTION 102113  
PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

- B. Related Requirements:

- 1. Section 061000 "Rough Carpentry" for blocking.
  - 2. Section 102800 "Toilet Room Accessories" for toilet tissue dispensers, grab bars, and similar accessories mounted on toilet compartments.

1.3 COORDINATION

- A. Coordinate requirements for blocking, reinforcing, and other supports concealed within wall to ensure that toilet compartments can be supported and installed as indicated.

1.4 ACTION SUBMITTALS

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

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

- B. Shop Drawings: For toilet compartments.

- 1. Include plans, elevations, sections, details, and attachment details.
  - 2. Show locations of cutouts for compartment-mounted toilet accessories.
  - 3. Show locations of centerlines of toilet fixtures.
  - 4. Show locations of floor drains.
  - 5. Show ceiling-mounted items, and overhead support or bracing locations.

- C. Samples for Initial Selection: For each type of toilet compartment material indicated.
  - 1. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
  - 1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
  - 2. Each type of hardware and accessory.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.
  - 1. Door Hinges: two (2) hinges with associated fasteners.
  - 2. Latch and Keeper: Ten (10) latches and keepers with associated fasteners.
  - 3. Door Bumper: Ten (10) bumpers with associated fasteners.
  - 4. Door Pull: Four (4) door pulls with associated fasteners.
  - 5. Fasteners: Twenty (20) fasteners of each size and type.

## 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Santana Products Co.
- B. Bobrick Washroom Equipment, Inc.
- C. Bradley Corporation

## 2.2 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286
- 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: 75 or less.
  - 2. Smoke-Developed Index: 450 or less.
- C. Regulatory Requirements: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 for toilet compartments designated as accessible.

## 2.3 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Toilet-Enclosure Style: Overhead braced.
- B. Urinal-Screen Style: Wall hung.
- C. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material. Provide with no-sightline system consisting of door and pilaster lapped edges on strike side of door and door and pilaster lapped edges on hinge side of door (unless continuous hinge is used).
  - 1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
  - 2. Heat-Sink Strip: Manufacturer's standard continuous, stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
  - 3. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range
- D. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- E. Brackets (Fittings): This project prefers the full-height (continuous) type fittings unless selected manufacturer cannot provide. If manufacturer can provide either bracket, then the continuous type shall be selected.
  - 1. Stirrup Type: Ear or U-brackets, stainless steel.
  - 2. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

## 2.4 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
  - 1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless-steel continuous, cam type that swings to a partially open position, allowing emergency access by lifting door. Mount with through-bolts.

2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
  3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
  4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
  5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

## 2.5 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless-Steel Castings: ASTM A 743/A 743M.
- G. Zamac: ASTM B 86, commercial zinc-alloy die castings.

## 2.6 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

- 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 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
  - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: 1/2 inch.
    - b. Panels and Walls: 1 inch.
  - B. Brackets: This project prefers the full-height (continuous) type fittings unless selected manufacturer cannot provide. If manufacturer can provide either bracket, then the continuous type shall be selected.
    - 1. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
      - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
      - b. Align brackets at pilasters with brackets at walls.
    - 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
      - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
      - b. Align brackets at pilasters with brackets at walls.
- C. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.
- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

### 3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

## SECTION 102800

### TOILET ROOM ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:

1. Restroom accessories.
2. Hand dryers.
3. Childcare accessories.
4. Underlavatory guards.
5. Custodial accessories.

- B. Related Requirements:

1. Section 102113 Plastic Toilet Compartments for mounting surfaces for accessories.

##### 1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Coordinate the work of this Section with the placement of internal wall reinforcement to receive inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

##### 1.4 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

3. Include electrical characteristics.
- B. Samples: Full size, for each exposed product and for each finish specified.
1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated.
  2. Identify accessories using designations indicated.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

#### 1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, visible silver spoilage defects.
  2. Warranty Period: 15 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Structural Performance: Design accessories and fasteners to comply with the following requirements:
1. Grab Bars, Vertical and Horizontal: Installed units are able to resist 250 lbf (1112 N) concentrated load applied in any direction and at any point.

#### 2.2 RESTROOM ACCESSORIES

- A. Source Limitations: Obtain public-use and private-use restroom accessories from single source from single manufacturer.
- B. Manufacturers:
1. Bradley Corp., Menomonee Falls WI, 53051
  2. Bobrick Washroom Equipment, Inc., Clifton Park, New York.



3. TrueBro Inc., Ellington, CT 06029
- C. Toilet Tissue Dispenser (TA6):
1. Bradley, one per Toilet Compartment.
  2. Description: Unit with double-roll toilet tissue dispenser.
  3. Mounting: Partition mounted, dual access with two tissue rolls per compartment or Partition mounted, dual access with two tissue rolls per compartment and with one side that mounts flush with partition of accessible compartment.
  4. Toilet Tissue Dispenser Capacity: 4-1/2- or 5-inch-diameter tissue rolls.
  5. Toilet Tissue Dispenser Operation: Controlled delivery with theft-resistant spindles.
  6. Material and Finish: Stainless steel, No. 4 finish (satin) 18 gauge.
  7. Lockset: Tumbler type.
- D. Combination Towel (Folded) Dispenser/Waste Receptacle (TA2):
1. Bradley
  2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
  3. Mounting: Semirecessed.
- E. Waste Receptacle (TA2):
1. Bradley
  2. Mounting: Open top, Surface-mounted
  3. Minimum Capacity: 4 Gallon (15 Liter)
  4. Material and Finish: Stainless steel, No. 4 finish (satin)] 18 guage.
  5. Liner: Reusable vinyl liner.
  6. Lockset: Tumbler type for waste receptacle.
- F. Liquid-Soap Dispenser (TA1):
1. Bradley
  2. Description: Designed for dispensing soap in liquid form.
  3. Mounting: Horizontally oriented, surface mounted.
  4. Capacity: Min 12 oz.
  5. Materials: Stainless Steel. Retain "Lockset" and "Refill Indicator" subparagraphs below if required.
  6. Lockset: Tumbler type.
  7. Refill Indicator: Window type.
- G. Grab Bar, Vertical and Horizontal (TA5):
1. Bradley models 8122-00142 and 8122-00136 and 8122-00118.
  2. Mounting: Flanges with concealed fasteners.
  3. Material: Stainless steel, 0.05 inch thick.
    - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
  4. Outside Diameter: 1-1/2 inches.
  5. Configuration and Length: As indicated on Drawings, Straight-Horizontal at 36 inches long, Straight-Horizontal at 48 inches long and Straight-Vertical at 18 inches long..
- H. Mirror Unit (TA4):
1. Bradley 7481
  2. Framed Stainless Steel security mirror: fabricated of 20-gauge type 430 stainless steel, bright annealed. Stretcher leveled for uniform finish. Reflective surface is bright and smooth with a mirror like finish after being polished to a #8 architectural finish. One unit for each standard lavatory except Single-Use Toilet Room.
  3. Frame: Stainless-steel channel.

- a. Corners: Welded and ground smooth.
- 4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
  - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- 5. Size: 24x36 inches.

I. Sanitary-Napkin Disposal Unit (TA9):

- 1. Mounting: Partition mounted and Surface mounted.
- 2. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
- 3. Receptacle: Removable.
- 4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

## 2.3 HAND DRYERS

A. Source Limitations: Obtain hand dryers from single source from single manufacturer. Quantity per plans.

B. High-Speed Air Dryer (TA3):

- 1. Dyson.
- 2. Description: Airblade V. High-speed, unheated-air hand dryer for rapid hand drying.
- 3. Mounting: Surface mounted, with low-profile design.
  - a. Protrusion Limit: Installed unit protrudes maximum 4 inches from wall surface.
- 4. Operation: Infrared-sensor activated with timed power cut-off switch. Average Dry Time: 12 seconds.
- 5. Maximum Sound Level: 79dB
- 6. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
- 7. Electrical Requirements: 208 to 240 V, 9 to 10 A, 1900 to 2300 W

## 2.4 CHILDCARE ACCESSORIES

A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.

B. Diaper-Changing Station (TA8):

- 1. KoalaKare. Model KB200-05SS
- 2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
  - a. Engineered to support minimum of 250-lb static load when opened.
- 3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
- 4. Operation: By pneumatic shock-absorbing mechanism.
- 5. Material and Finish: Stainless steel, No. 4 finish (satin), exterior shell with rounded plastic corners; HDPE interior in manufacturer's standard color. Architect to select color from full-range of manufacturer's standard colors.
- 6. Liner Dispenser: Built in.

## 2.5 UNDERLAVATORY GUARDS

A. Underlavatory Guard (PG):

- 1. TruBro LavGuard 2

2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

## 2.6 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.
- B. Mop and Broom Holder Shelf Unit (TA7):
  1. Bobrick
  2. Description: Shelf with mop and broom holders and hooks.
  3. Length: 34 inches.
  4. Hooks: Four (4).
  5. Mop/Broom Holders: Three (3), spring-loaded, rubber hat, cam type.
  6. Material and Finish: Stainless steel, No. 4 finish (satin). Shelf: Not less than nominal 0.05-inch-thick stainless steel.

## 2.7 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

## 2.8 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of 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 manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

## SECTION 124816

### ENTRANCE FLOOR GRILLES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:

- 1. Recessed floor grilles and frames.
- 2. Cement board underlayment for installation of recessed floor grilles.

##### 1.3 COORDINATION

- A. Coordinate size and location of recesses in existing wood floors to receive floor grilles and frames.

##### 1.4 ACTION SUBMITTALS

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

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for entrance floor grilles and frames.

- B. Shop Drawings:

- 1. Submit plans and details showing layout of grid and frame specified including details indicating construction relative to materials, direction of traffic, spline locations, profiles, anchors and accessories.
- 2. Divisions between grille sections.
- 3. Perimeter floor moldings.

- C. Samples: For the following products, in manufacturer's standard sizes:

- 1. Submit an assembled section of floor grid and frame members with selected tread insert showing each type of color for exposed floor grid, frame and accessories required.

##### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor grilles and frames to include in maintenance manuals.

## SECTION 124816

### ENTRANCE FLOOR GRILLES

#### 1.6 QUALITY ASSURANCE

- A. Slip resistance in accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 for accessible routes.
- B. Single Source Responsibility: Obtain floor grids and frames from one source of a single manufacturer.
- C. Utilize superior stainless-steel components- type 316.
- D. Manufacturer shall use flatbed fabrication method.
- E. Utilize a manufacturer that is ISO 9001 & 14001 certified.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

#### 1.8 FIELD CONDITIONS

- A. Field measurements: Check actual openings for grids 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. Recessed Conditions: For proper installation, recesses must be flat and smooth throughout. Recesses may require leveling compound to achieve the proper depth and a smooth finish. The final recess depth will match the specified product and must be field verified. For proper frame installation, the side walls of the recesses must also be straight and smooth. Inconsistencies with the recess and side walls must be remediated prior to product installation.

#### 1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace entrance grilles that fail in materials or factory workmanship within specified warranty period.

Warranty Period: 5 years from date of installation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties, Inc.; GridLine® G6 or a comparable product by one of the following:

## SECTION 124816

### ENTRANCE FLOOR GRILLES

1. [J. L. Industries, Inc.; Activar Construction Products Group, Inc.](#)
2. [K.N. Crowder Mfg. Inc.](#)
3. [Kadee Industries, Inc.](#)

#### 2.2 ENTRANCE FLOOR GRILLES, GENERAL

- A. Structural Performance: Provide floor grilles and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:
  1. Rolling load capacity: wheel load of 1000 lb per wheel.
- B. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

#### 2.3 FLOOR GRILLES

- A. General: Provide manufacturer's standard floor-grille assemblies consisting of treads of type and profile indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.
- B. Stainless Steel Floor Grille: Type 316.
  1. Surface Treads: 0.090-by-0.150-inch wire with 0.145-inch- wide openings between wires.
  2. Support Bars: Electronically welded to each wire.
  3. Grille depth: 3/8 inch deep.
  4. Stainless Steel Finish: ASTM A480/A480M No. 4.
  5. Grille Size: As indicated in drawings.
- C. Hidden Lockdown: 1 1/4" (31.75mm) x 1 1/4" (31.75mm) x 1/8" (3.175mm), Type 316 stainless steel, welded hold down tabs to secure grille to secure surface.

#### 2.4 FRAMES

- A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.
  1. Type 316 stainless steel with 1/8" (3.2mm) exposed surface and welded hold-down tabs at 12" o.c.
  2. Stainless Steel Finish: ASTM A480/A480M No. 4.

#### 2.5 SUPPORT SYSTEM

- A. Level Bed Applications: Provide manufacturer's standard support system and leveling compound.

## SECTION 124816

### ENTRANCE FLOOR GRILLES

#### 2.6 DRAIN PANS

- A. Provide manufacturer's standard, 0.050-inch- thick, stainless steel sheet drain pan.

#### 2.7 CEMENT BOARD UNDERLAYMENT

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
  - 1. Subject to compliance with requirements, provide USG Corporation Durock® Brand Cement Board or comparable product by one of the following:
    - a. [Custom Building Products](#).
    - b. [Georgia-Pacific Gypsum LLC](#).
  - 2. Thickness: 1/4 inch.
- B. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274

#### 2.8 MATERIALS

- A. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 316.
- B. Stainless Steel Flat Bars: ASTM A666, Type 316.
- C. Stainless Steel Angles: ASTM A276 or ASTM A479/A479M, Type 316.

#### 2.9 FABRICATION

- A. Shop fabricate floor grilles to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.
- B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

#### 2.10 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 1. Run grain of directional finishes with long dimension of each piece.



## SECTION 124816

### ENTRANCE FLOOR GRILLES

2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: ASTM A480/A480M No. 4.

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of floor grilles and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

##### 3.2 INSTALLATION

- A. Install recessed floor grilles, frames and drain pans to comply with manufacturer's written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set floor-grille tops at height for most effective cleaning action. Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.

##### 3.3 PROTECTION

- A. After completing frame installations, provide temporary filler of plywood or fiberboard in floor-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.
- B. Defer installation of floor grids until time of substantial completion of project.

END OF SECTION 124816

## SECTION 171000

### REMOVAL/DISPOSAL OF PCB, MERCURY-CONTAINING AND MISCELLANEOUS MATERIALS

#### PART 1 GENERAL

##### 1.1 STIPULATIONS

- A. The specifications sections “General Conditions”, “Special Requirements” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.

##### 1.2 RELATED DOCUMENTS

- A. The specifications sections “General Conditions”, “Special Requirements” and “General Requirements” form a part of this section by reference thereto and shall have the same force and effect as if printed herewith in full.
- B. The Contractor is responsible to furnish all labor, materials, facilities, equipment, services, permits and agreements necessary to perform the work required for removal of PCB-containing ballasts, mercury-containing light tubes, mercury-containing thermostat devices, and Miscellaneous Materials in accordance with these specifications, and all local, state and federal regulations; (40 CFR 761, Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce and Use Prohibitions); (49 CFR 178, Shipping Container Specifications).

##### 1.3 SCOPE OF WORK

- A. Contractor Submittal Register: Minimum pre-mobilization Contractor submittals should include but is not limited to the following:
- B. The Contractor shall submit an air monitoring schedule for approval prior to work.
- C. Final payment to the Contractor will not be processed until the final report from the QA Firm has been received and approved.

##### 1.4 REGULATORY SUBMITTALS (CONTRACTOR RESPONSIBILITY)

- A. Work required by this section includes removal, handling and disposal / recycling of all PCB-containing ballasts, mercury-containing fluorescent light tubes and mercury-containing thermostats located at Disston Recreational Center and the disposal of Miscellaneous Materials.
- B. For the purpose of this project, all ballasts which do not have the term “No PCB’s” printed on the label must be assumed to be PCB-containing and be removed and disposed of as such. Ballasts which have the term “No PCB’s” printed on the label may be disposed of as construction and demolition waste. Intact, non-leaking PCB containing ballasts (small capacitor) may be disposed of as municipal solid waste, as allowed by regulation. Municipal solid waste landfills, at its option, may not accept non-leaking PCB containing ballasts (small capacitor) due to permitting

PROJECT No. 16228E-03-01

17100 –1

REMOVAL/DISPOSAL OF PCB, MERCURY-CONTAINING AND MISCELLANEOUS MATERIALS

requirements. It is recommended that mercury florescent bulbs and mercury switch items shall be recycled, as applicable, as opposed to being treated as a hazardous waste items per EPA disposal requirements as outlined in Part 6.

C. Location and quantity of PCB Ballasts, Fluorescent Light Tubes and Thermostats are as follows:

D. Location and quantity of Miscellaneous Materials are as follows:

Disston Recreational Center		
PCB Ballasts	Mercury Containing Light Tubes	Mercury Thermostat
21	30	0

E. The Contractor shall be responsible to verify all quantities and to determine job site conditions.

Disston Recreational Center		
Miscellaneous Cleaning Chemical	Paint/Flammable/Combustible Liquids	Fire Extinguishers
15 gallons	4	1
Light Bulbs	Radiators	Exit Signs
4	5	2
Fire Alarms	Engine Oil	Stripper
1	12 oz	2 gallons

**PART 2                    ENVIRONMENTAL REQUIREMENTS**

2.1 Use special clothing, including but not limited to disposable gloves (polyethylene) and eye protection.

**PART 3                    EXECUTION**

3.1 Ensure that work operations or processes involving PCB ballasts, PCB-contaminated materials, mercury, and Miscellaneous Materials are conducted in accordance with 40 CFR 761 and the applicable requirements of this section, including but not limited to:

- A. Obtaining advance arrangements of recycling / disposal sites.
- B. Notifying Contracting Officer prior to commencing the operation.

PROJECT No. 16228E-03-01

17100 -2

REMOVAL/DISPOSAL OF PCB, MERCURY-CONTAINING AND MISCELLANEOUS MATERIALS

- C. Reporting leaks and spills to the Contracting Officer.
  - D. Cleaning up spills.
  - E. Inspecting waste containers for leaks and forwarding copies of inspection reports to the Contracting Officer.
  - F. Maintaining inspection, inventory, and spills.
- 3.2 Spill/Cleanup requirements.

- A. Immediately report to the Contracting Officer any PCB or mercury spills/leaks.
- B. Rope off area around edges of leak or spill and post caution signs at the area.
- C. Initiate cleanup of spills as soon as possible. Mop up any liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as solid waste.
- D. Document the cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup. Provide certification of documentation.

#### PART 4      STORAGE / LABELING OF CONTAINERS

- 4.1 Store materials in DOT Specification 5, 5B or 17C containers with removable heads – 49 CFR 178. Boxes shall be suitable for fluorescent light tubes. Label containers with the following:
- A. Date the item was placed in storage and the name of the cognizant activity and building.
  - B. Affix caution labels to all hazardous waste containers.

#### PART 5      IDENTIFICATION NUMBER

- 5.1 Identification Number – Federal regulations require that generators, transporters, commercial storers, and disposers of regulated hazardous waste possess U.S. EPA identification numbers. The Contractor shall verify that the activity has a U.S. EPA generator identification number for use on the Uniform Hazardous Waste Manifest (EPA Form 8700-22). If not, the Contractor shall advise the activity that it must file and obtain an identification number with EPA prior to commencement of removal work. (Not applicable to item listed in 6.1)

#### PART 6      TRANSPORTER CERTIFICATION / CERTIFICATE OF DISPOSAL

- 6.1 Comply with disposal requirements and procedures as outlined in 40 CFR.
- A. Intact, non-leaking PCB containing ballasts (small capacitor) may be disposed of as municipal solid waste per 40 CFR 761.60(b)(2)(ii). Ensure that the

municipal solid waste landfill will accept non-leaking PCB containing ballasts before transport.

- B. Mercury containing fluorescent lamp bulbs may be recycled as universal waste, as an option, instead of a hazardous waste.
  - C. Mercury containing thermostats may be recycled as universal waste, as an option, instead of a hazardous waste. DEP, at their option, may accept mercury as a small quantity exempt generator on a one time basis only. Call for information at (814) 332-6839 or (814) 451-6009 (Erie).
- 6.2 Certificate for the hazardous materials disposed of / recycled shall include:
- A. The identity of the disposal facility, by name, address and EPA identification number.
  - B. The identity of the hazardous waste affected by the Certificate of Disposal including reference to the manifest number for shipment.
  - C. A statement certifying the fact of disposal / recycling of the identified hazardous waste, including the dates of disposal and identifying the disposal process used.
  - D. A certification (for PCB's) as identified in 40 CFR 761, Section 3.

END OF SECTION

SECTION 224713

DRINKING FOUNTAINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. ADA compliant, dual height drinking fountain with bottle filling station.
2. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of drinking fountain and bottle filling station.

B. Shop Drawings:

1. Include diagrams for power wiring.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Standards:

1. Drinking fountains and bottle filling stations intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 or NSF 372, or be certified in compliance with NSF 61 or NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.
2. Comply with ASME A112.19.3/CSA B45.4 for stainless steel drinking fountains and bottle filling stations.
3. Comply with NSF 42 and NSF 53 for water filters for drinking fountains and bottle filling stations.
4. Comply with ICC A117.1 for accessible drinking fountains and bottle filling stations.
5. Comply with UL399.
6. Drinking fountain shall be Green Spec listed.

## SECTION 224713

### DRINKING FOUNTAINS

#### 2.2 DRINKING FOUNTAINS

- A. Drinking Fountain with Bottle Filling Station - Surface Wall-Mounted, Stainless Steel, Bi-Level.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay® LZSTL8WSLP or comparable Owner approved equal.
  2. Fountain shall be ADA compliant and GreenSpec listed
  3. Lower units shall have push bar activation. Bottle filling units shall include electronic sensors for touchless activation.
  4. Bottle filling station shall deliver 8 GPH of 50 °F drinking water.
  5. Unit shall be stainless steel construction with integral drain.
  6. Filter: One or more water filters with capacity sized for unit peak flow rate.
  7. Electrical Characteristics:
    - a. Volts: 10 V ac.
    - b. Phase: Single.
    - c. Hertz: 60 Hz.
  8. Support: Provide manufacturer's mounting plate and drinking fountain carrier.
  9. Drinking Fountain Mounting Height: High/low - standard/accessible in accordance with ICC A117.1.
  10. Freeze-Resistant Supply Fittings: Through wall freeze-resistant shutoff and flow-control valve assembly.

#### 2.3 SUPPORTS

- A. Drinking Fountain Carrier:
1. Standard: ASME A112.6.1M.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- B. Set pedestal drinking fountains and bottle filling stations on flat surface in accordance with manufacturer's written installation instructions.
- C. Install recessed, drinking fountains and bottle filling stations secured to wood blocking in wall construction.
- D. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

## SECTION 224713

### DRINKING FOUNTAINS

- E. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation.
- F. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- H. Seal joints between fixtures 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."

### 3.2 PIPING CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

### 3.3 ELECTRICAL CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
- C. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
  - 1. Nameplates to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch (13 mm) high.

### 3.4 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.

### 3.5 CLEANING

- A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
- C. Provide protective covering for installed fixtures.



SECTION 224713

DRINKING FOUNTAINS

- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224713

SECTION 260500  
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. This Section is coordinate with and complementary to the General Conditions and Supplementary General Conditions of the work, wherever applicable to Mechanical and Electrical Work.
- B. Drawings are diagrammatic and are a graphic representation of contract requirements to the best available standards at the scale required. Sizes and locations of equipment are shown to scale where possible, but may be distorted for clarity on the Drawings. Final locations of outlets and equipment shall be as shown in enlarged details or as approved by the Architect or his representative.
- C. Light and power and system riser diagrams and schematic diagrams generally indicate existing equipment connections in addition to equipment connections to be used for various systems. System conduit and wiring shall be as required for actual systems installed on this project. Provide all work shown on diagrams whether or not it is duplicated on the plans.
- D. Division 23 - Basic Mechanical Requirements.
- E. Division 23 - Electrical Requirements for Mechanical Equipment.

1.2 SCOPE OF WORK

- A. The Specifications and the accompanying Drawings are intended to secure the provisions of all material, labor, equipment, and services necessary to install complete, test, and make ready for operation the Electrical Systems in accordance with the Specifications and Drawings. All systems shall be complete with necessary appurtenances and minor auxiliaries, including pull boxes, offsets to clear interferences, and supports which are not shown but are needed to make each system complete in every respect. All work described in the Specifications and not shown on the Drawings, or vice versa, shall be furnished in complete working order. If mention has been omitted of any item of work or material necessary for completion of the system, then such items must be and are hereby included. The work includes but is not limited to the following:
  - 1. Raceways and installation components.
  - 2. Wire and Cable.
  - 3. Panelboards Lighting and Distribution.
  - 4. Fuses.
  - 5. Safety and disconnect switches.

SECTION 260500  
GENERAL REQUIREMENTS

6. Service and Distribution equipment.
7. Motor controllers.
8. Emergency generators.
9. Manual motor starters.
10. Control equipment.
11. Control and alarm wiring system.
12. Grounding system.
13. Modifications to fire alarm system.
14. Modifications to the security system
15. Testing.
16. Alternate pieces.
17. Furnishing and setting of all sleeves through floors, roof and walls where required, including waterproofing and fireproof sealing and cap flashing.
18. Excavation and backfill (Excavation in rock shall be included).
19. All concrete work for site lighting pole bases and patch work.
20. Hardware, such as inserts, bolts, etc., associated with concrete bases.
21. Cutting, drilling and boring associated with electrical work.
22. Prime painting, where required for electrical equipment and installation.
23. Provisions for temporary light and power.
24. Final connection of all equipment unless otherwise noted.
25. Seismic restraints.

1.3 EXAMINATION OF EXISTING CONDITIONS ON PREMISES

- A. Before submitting his bid, this Contractor shall visit the site of the work and shall thoroughly familiarize himself with the observable existing conditions affecting the work. By the act of submitting a bid, the Contractor shall be deemed to have made such an examination and to have accepted such conditions and to have made allowance therefore in preparing his bid. No additional compensation will be granted on account of extra work made necessary by the Contractor's failure to investigate such existing conditions. Verify all grades, elevations, dimensions and clearances at the site.

1.4 REMOVAL AND RELOCATION OF EXISTING WORK

- A. Disconnect, remove and/or relocate electrical material, equipment, devices, components, and other work noted and required by demolition or alterations in existing construction.
- B. Provide new material and equipment required for relocated equipment.
- C. Remove conductors from existing raceways to be rewired. Clean raceways as required prior to rewiring.
- D. Tape both ends of abandoned conductors, and cap outlets and abandoned raceways.
- E. Cut and cap abandoned floor raceways flush with concrete floor or behind walls and ceilings.
- F. Dispose of removed raceways and wiring. Turn over removed electrical equipment to Owner or discard as directed. Salvage equipment shall be limited to existing lighting fixtures, and panel boards.

SECTION 260500  
GENERAL REQUIREMENTS

- G. All electrical work in adjoining areas, whether indicated on the Drawings or not, which is to continue to function but is affected by demolition work shall be reconnected and restored to present function as part of the electrical system of the building.
  - H. Connect new work to existing work in a neat and acceptable manner, with minimum interference to existing facilities.
  - I. Maintain continuous operation of existing facilities affected by the work. The Electrical Contractor shall do all work necessary to permit the operation of all existing electrical systems during the construction period.
  - J. Alarm and emergency systems shall be interrupted only with the written consent of the Owner.
  - K. Alterations and additions to the present electrical systems being retained shall be performed with a minimum interruption in the operating of these systems. Temporary shutdowns, when required, shall be made only with written consent of Owner at times not to interfere with normal operations. The Electrical Contractor shall be responsible for all overtime work necessary to meet this requirement. If interruptions must occur during the normal hours at the building, the Electrical Contractor shall, at his own expense, provide temporary services as required to permit the normal functioning of all active facilities during the interruption.
  - L. Where indicated on the Drawings or required by alteration scheme, the Electrical Contractor shall remove all electrical outlets, switches, and other devices, complete with associated wiring, conduit, etc., from partitions, walls, and floors that are to be removed. When the removal of these makes dead electrical wiring that is to remain, the Electrical Contractor shall install junction boxes or other devices necessary to make the circuits affected continuous and ready for operation. Otherwise, wiring shall be removed back to the nearest electrical outlet box that is to remain, or to the panelboard.
  - M. All raceways which become exposed beyond finished surfaces because of the alteration work shall be removed and rerouted behind finished surfaces.
  - N. Wiring that is to be removed as a result of demolition work, but is required to continue to function, shall be interrupted at convenient locations, rerouted (new wiring and conduits) and reconnected. New materials shall be equivalent to existing ones in all respects; conductor ampacity, conduit size, etc.
- 1.5 DISPOSAL OF REMOVED MATERIAL
- A. All material removed and not to be reused shall be disposed of in accordance with all applicable local, state, and federal regulations.
  - B. All fluorescent lamp ballasts shall be disposed of in accordance with the Toxic Substance Control Act of 1976 which states that all PCB-containing lighting fixture ballasts that are leaking shall be treated as hazardous waste. PCB-containing ballasts that are not leaking can be either incinerated, or dismantled so that the recyclable materials can be separated from the PCB-containing components, which shall be incinerated or taken to a hazardous waste landfill.
  - C. All mercury-containing lamps; i.e., fluorescent, high pressure sodium, mercury vapor and metal halide; that are to be removed shall be disposed of in accordance with current Resource Conservation and Recovery Act regulations.

SECTION 260500  
GENERAL REQUIREMENTS

1.6 QUALITY ASSURANCE AND STANDARDS

- A. The complete installation shall be in accordance with the applicable requirements and standards of National Electrical Manufacturers Association (NEMA), National Fire Protection Association (NFPA), International Building Code (IBC), Local Inspection Agency, along with state and local municipal codes and all applicable codes and authorities having jurisdiction. Any items or requirements noted in the Specifications or on Drawings which conflict with these shall be referred to the Architect for decision. All work necessary to comply with these requirements shall be performed by the Contractor at no extra cost to the Owner.
- B. All electrical equipment, materials, and appliances shall have the listing of Underwriter's Laboratories, Inc., and shall bear labels attesting to UL listing.

1.7 SUBMITTALS

- A. Follow the procedures specified in Division 1 Section "Submittals". Increase by one additional copy submittals of electrical related product data (to be retained by Architect).
- B. The Contractor shall submit shop drawings with such promptness as to cause no delay in his own work or that of another contractor.
- C. Submit shop drawings complete in every detail for items as described in the contract documents, or as may be required by the Architect.
- D. Submit shop drawings as indicated in subsequent Sections of this Specification.

1.8 COORDINATION OF WORK WITH OTHER TRADES

- A. The work of this Section shall be coordinated with the work of all other Contracts, the Utility Company, and the Telephone Company. It shall be so arranged that there will be no delay in the proper installation and completion of all work.
- B. Examine all Architectural, Structural, Heating, Ventilating and Air Conditioning, Sprinkler and Plumbing Drawings relating to this Project, and verify all governing conditions at the site and become fully informed as to the extent and character of the work required and its relation to other work in the building. No consideration will be granted for any alleged misunderstanding of the materials to be furnished for work to be done.
- C. Scaled and figured dimensions with respect to the items are approximate only; sizes of equipment have been taken from typical equipment items of the class indicated. Before proceeding with work, the Contractor shall carefully check all dimensions and sizes and shall assume full responsibility for the fitting in of equipment and materials to the building and to meet architectural and structural conditions.

SECTION 260500  
GENERAL REQUIREMENTS

- D. Coordinate work with other disciplines. Confer with other contractors whose work might affect this installation; and arrange all parts of this work and equipment in proper relation to the work and equipment of others, with the building construction and with architectural finish so that this work will harmonize in service, appearance, and function.
- E. Examine all work prepared by others to receive the work of this Section and report any defects affecting installation to the General Contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.
- F. Exposed piping shall be installed to provide the maximum amount of headroom but in no case shall piping be installed less than seven feet six inches clear (7' 6") above the finished floor. Piping installed in areas where hung ceilings or other furred spaces are indicated shall be installed concealed.
- G. The Contractor is referred to the Architectural Drawings for locations and types of hung ceilings and furred spaces.
- H. Verify locations of all electrical equipment with Architectural Drawings and interior details and finishes. In centering outlets and locating boxes and outlets, allow for overhead pipes, ducts, trim, paneling, hung ceilings and the like and correct any inaccuracy resulting from failure to do so without expense to Owner.
- I. The Electrical Contractor shall coordinate all ceiling work with Ceiling Contractor and shall determine ceiling type prior to the purchasing and installation of lighting fixtures, speakers, smoke detectors, exit lights or any other ceiling mounted electrical elements. Electrical work shall also be coordinated with location of diffusers, sprinklers and other mechanical work.
- J. The Electrical Contractor shall prepare layout drawings showing all of electrical elements required to be in or at the ceiling. The Electrical Contractor shall coordinate with the ceiling design and all elements to be installed in or at the ceiling by the Contractors for Mechanical, Plumbing and Fire Protection work. It is intended that all electrical, mechanical and plumbing features be organized and arranged in regular patterns. The Electrical and Mechanical Contractors shall cooperate with each other and the Architect in the placement of each of their various systems in order to accomplish the regularly organized ceilings that are required for the project.
- K. Where work will be installed in close proximity to work of other trades, or where there is evidence that the work will interfere with the work of other trades, assist in working out space conditions to make a satisfactory installation of all trades. The Electrical Contractor shall prepare coordinated drawings and sections at a scale of not less than  $3/8" = 1'-0"$ , clearly showing how work is to be installed in relation to work of other trades.
- L. The Electrical Contractor shall ascertain where all equipment rooms, shafts, and equipment spaces have been planned for his use. Before proceeding with any work, the Electrical Contractor shall carefully check and verify all dimensions, sizes, etc., and assume full responsibility for the fitting-in of his equipment and materials to the other parts of the

SECTION 260500  
GENERAL REQUIREMENTS

equipment and to the structure. Coordinate all work with all trades that make use of the same spaces for best utilization of available room. Any changes to building structure required to accommodate the work of this Division shall be initiated, coordinated, provided, and paid for by the Electrical Contractor. Any such modifications shall be reviewed and accepted in writing beforehand by the Architect.

- M. The Electrical Contractor shall constantly refer to the drawings of all other trades to coordinate the Electrical work with the other work on the project. The Electrical "as-built" construction drawings being prepared by the Electrical Contractor shall reflect any changes as they occur.
- N. When roughing-in is to be furnished for connection of equipment in this contract, or for equipment by others, approximate locations of connections are shown. The right is reserved to change locations shown before installation at no increase in cost unless there is a significant increase in the amount of material required.
- O. Installation, connection, and inter-connection of systems shall be completed in accordance with manufacturer's instructions and the best practices of trade. All Contractors shall provide information and help necessary to facilitate the installation, or connection of their work by other trades.
- P. All conduits and wiring shall be run close to ceiling where conditions allow.

1.9 INSPECTION AND TESTS

- A. At the time of the final inspection and tests, all connections at the panels and all splices, etc., must have been completed. All fuses must be in place and the circuits continuous from service switches to all receptacles, outlets, motors, etc. Each entire wiring system must test free from short circuits and grounds. When wiring systems are "megger" tested, the insulation resistance between conductors and between conductors and grounds, based on maximum load, shall not be less than that required by the National Electrical Code and local authorities having jurisdiction. A written record (five copies) of all test data shall be supplied to the Architect. The tests shall cover but not be limited to the following:
  - 1. Secondary service and distribution system.
  - 2. Fire alarm system.
  - 3. All communications, signaling and alarm systems.
  - 4. 10% of all power installations and motor controls randomly selected by the Architect.
  - 5. 10% of all light installations and circuit switching randomly selected by the Architect.
  - 6. Any part of the work called for in the Specifications and/or on the Drawings and as designated by the Architect.
- B. Provide all necessary testing equipment, instruments, and skilled personnel for the tests. If in the opinion of the Architect, the results of such tests show that the work has not complied with the requirements of the Specifications or Drawings, the Contractor shall make all additions or

SECTION 260500  
GENERAL REQUIREMENTS

changes necessary to put the system in proper working condition and shall pay for all expenses and for all subsequent tests which are necessary to determine whether the work is satisfactory. Any additional work or subsequent tests shall be carried out at the convenience of the Owner prior to final payment.

1.10 PERMITS, CERTIFICATES AND FEES

- A. Obtain and deliver a final Certificate of Approval from the applicable inspection authority having jurisdiction. Make delivery to the Architect for transmittal to the Owner upon completion of the work and before final payment. Pay all charges made by the inspection authority and include their cost in the bid.
- B. This work shall include the procurement of and payment for all permits, certificates and fees for the performance of the electrical work in compliance with codes, applicable laws and municipal regulations including those from local utilities for services.

1.11 PROTECTION, MAINTENANCE AND PRODUCT HANDLING OF ELECTRICAL EQUIPMENT

- A. Electrical equipment shall be delivered and stored at the site, properly packed and crated until finally installed. Store materials in spaces as designated. Investigate each space through which equipment must be moved. If necessary, equipment shall be shipped from manufacturer in crated sections of size suitable for moving through restricted spaces.
- B. Provide effective protection against damage for all material and equipment during shipment and storage at the Project Site. Cover all stored equipment to exclude dust and moisture. Place stored conduit on dunnage with appropriate weather cover and caps on exposed ends.
- C. Uninstalled equipment and materials shall be adequately protected against loss or theft; damage caused by water, paint, fire, plaster, moisture, acids, fumes, dust or other environmental conditions; or physical damage; during delivery, storage, installation and shutdown conditions. This Contractor shall replace any damaged or stolen material without extra cost to the Owner.
- D. Provide effective protection for all material and equipment against damage that may be caused by environmental conditions. Do no work when conditions or temperature in area or moisture on materials or substrates are not in accordance with material manufacturer's recommend conditions for installation.
- E. This Contractor shall be responsible for the maintenance of all installed equipment and systems until final acceptance by the Architect and the Owner. The operation of the equipment by the Owner does not constitute an acceptance of the work. Work will be accepted only after the Contractor has adjusted his equipment, demonstrated that it fulfills the requirements of the Drawings and Specifications, and has furnished all required certificates.



SECTION 260500  
GENERAL REQUIREMENTS

- F. This Contractor shall guarantee in writing to the Owner that all work installed by him shall be free of defects in workmanship and materials and that all apparatus will develop the capacities and characteristics as indicated, and that, if during a period of one year from date of final approval of work by the Architect, any defects in workmanship, materials or performance appear, he will remedy them without any cost to the Owner. Guarantee requirements shall consist of the aforestated and other requirements, as established under applicable contract documents.
- G. After cabinets and boxes are installed, cover openings to prevent entrance of water and foreign materials. Close conduit openings with temporary metal or plastic caps, including those terminated in cabinets.
- H. Protect all rough and finished floors and other finished surfaces from damage which may be caused by construction materials and methods. Protect floors with tarpaulins, chip pans and oil proof floor covering. Protect finished surfaces from welding and cutting splatters with baffles and splatter blankets. Protect finished surfaces from paint droppings, adhesive and other mar-  
ring agents with drop cloths. Protect other surfaces with appropriate protective measures.
- I. Have materials delivered to site. Unload and store materials in designated location, and protect from damage. Deliver materials to their point of installation.
- J. Deliver materials to Project site in manufacturer's original unopened containers with manufacturer's name and product identification clearly marked thereon.

1.12 ACCESSIBILITY AND MEASUREMENTS

- A. All work shall be installed so as to be readily accessible for operation, maintenance and repair. Minor deviations from the plans may be made to accomplish this, subject to the approval of the Architect.
- B. Before ordering any material or doing any work, the Contractor shall verify all measurements at the Building, and shall be responsible for the correctness of same as related to the work under this Contract.

1.13 TEMPORARY LIGHT AND POWER

- A. Electric services for temporary light and power shall be obtained from the existing electrical service and extended as required. Coordinate with the Owner and provide all required material and work.
- B. The Electrical Contractor shall furnish, install and maintain the temporary lighting and power system for all Contractors. The use of electricity shall be kept to a minimum.
- C. The Owner will pay for all energy required by the temporary lighting and power system.

SECTION 260500  
GENERAL REQUIREMENTS

- D. Provide all wiring, supports, lamp sockets, receptacle sockets and any other materials, supplies or equipment necessary for temporary light and power system.
- E. Ground fault protection required by OSHA for temporary receptacle circuits shall be accomplished by providing branch circuit panels containing ground fault protection circuit breakers.
- F. Provide a grounding conductor connection to each receptacle grounding terminal. Minimum size branch circuit and grounding conductors shall be No. 12 AWG.
- G. Install separate stringer circuits for lighting and receptacles. Provide one lamp socket and one duplex receptacle (or two single receptacles) for every 400 square feet of new general construction area. (Approximately 20 feet on centers). In addition, provide one lamp socket and one duplex receptacle every 20 feet along the peripheral walls of the construction areas for temporary conditions. Each lamp socket shall be provided with a 100 watt lamp. Replace burned out lamps as required for as long as the temporary lighting system is maintained in operation.
- H. Provide sufficient supplementary temporary lighting to permit proper execution of the work. This supplementary lighting shall consist of but not be limited to the following:
  - 1. Construction hoist landings.
  - 2. Stairways and stairway landings where existing illumination is inadequate due to alterations or construction.
  - 3. Interior rooms not covered with general construction area lighting.

1.14 IDENTIFICATION NAMEPLATES

- A. Identify and mark all electrical equipment to meet OSHA standards and as specified herein.
- B. Furnish a nameplate for each separately installed feeder switch and circuit breaker, each individual panel, dry type transformer, disconnect switch, push button station, controller, manual motor starter, and equipment enclosure.
- C. Unless otherwise noted, nameplates shall be black laminate with white letters of uniform size consisting of reasonably large capital letters, 3/16-inch minimum.
- D. Inscription shall consist of name and number of equipment as shown on the Drawings and as approved by the Architect.

1.15 NAMES AND TRADE NAMES

- A. Where trade and manufacturers' names are specified or indicated on the Drawings, they are intended to indicate the standard of material or articles required. This shall not remove the responsibility of the Contractor from verifying the equipment's compliance with all rules and regulations governing the use of such equipment. No purchase of any equipment shall be done

SECTION 260500  
GENERAL REQUIREMENTS

without written authorization if such equipment will not abide with all rules and regulations covering its intended use.

1.16 MATERIAL AND WORKMANSHIP

- A. All material shall be new and of the best quality and shall have the Underwriters Laboratories label attached. The Label shall be of the type for the intended application. The work throughout shall be executed in the best and most thorough manner under the direction of, and to the satisfaction of the Architect, who will interpret the meaning of the Drawings and Specifications. The Architect shall have the power to reject any work and materials which, in his opinion, is not in full accordance therewith.
- B. If, after installation, operation of the equipment proves to be unsatisfactory to the Owner by reason of defects, errors or omissions, the Owner reserves the right to operate equipment until it can be removed from service for correction by Contractor. Contractor shall pay for damages to work of other trades caused by this defective equipment and its replacement.

1.17 SEISMIC RESTRAINTS

- A. Provide lateral restraints for all electrical equipment installed on project. Typically lateral restraints shall consist of angle iron and "uni strut" bracing, cross bracing, hanger rods, anchor clips, expansion shield anchor bolts, etc. The purpose of the restraints is to provide resistance to lateral (horizontal) movement during earthquake.
- B. All equipment shall be anchored to the floor, ceiling structure or walls.
- C. All suspended equipment, wiring trough and conduit trade size 2 1/2" or larger shall have (lateral) horizontal bracing capable of resisting 10% of the equipment weight. Horizontal bracing shall be placed at each point where vertical supports are specified or required.
- D. Stem mounted fixtures shall have stems and swivel canopies designed for seismic loads. Ceiling outlet boxes and hangers for stem mounted fixtures shall have lateral bracing capable of withstanding full vertical load. Lateral bracing shall be attached to the ceiling (at an angle) or wall structure.
- E. Recessed and surface mounted light fixtures must be secured to the ceiling system so as to resist 25% of their weight laterally; i.e. a 40-pound fixture must be resistant to a 10-pound lateral force. Suitable anchor clips must be provided for all lay in fixtures. Surface mounted fixtures must be supported at two points in addition to the outlet box.

1.18 OPERATING INSTRUCTIONS (SYSTEMS AND EQUIPMENT FURNISHED UNDER ELECTRICAL WORK)

SECTION 260500  
GENERAL REQUIREMENTS

- A. Fifteen (15) days prior to the completion of all work and the final inspection of the installation by the Owner, five copies of a complete Instruction Manual, bound in booklet form and suitably indexed, shall be submitted to the Architect for approval. All written material contained in the Manual shall be typewritten or printed. Refer to Section 017823, "Operation and Maintenance Data."
- B. The Manual shall contain the following items:
1. Table of Contents
  2. Introduction
  3. Explanation of manual and its use.
  4. Description of system or equipment.
  5. Complete schematic drawings of all systems.
  6. Functional and sequential description of all systems.
  7. Systems operation:
    - a. Operation procedures.
    - b. All posted instruction charts.
  8. Maintenance:
    - a. Systems trouble shooting charts.
    - b. Procedures for checking out functions.
    - c. Recommended list of spare parts.
  9. Listing of Manufacturers.
  10. Manufacturer's Data (where multiple model, type and size listings are included, clearly and conspicuously indicate those that are pertinent to this installation):
  11. Description literature, drawings, illustrations, certified performance charts, technical data, etc.
  12. Operation.
  13. Maintenance including complete troubleshooting charts.
  14. Parts list.
  15. Names, addresses and telephone numbers of recommended repair and service companies.
  16. Guarantee data.

END OF SECTION

SECTION 260500  
GENERAL REQUIREMENTS

This Page Intentionally Left Blank

SECTION 26 05 19  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Building wires and cables rated 600 V and less.
- 2. Connectors, splices, and terminations rated 600 V and less.

- B. Related Sections include the following:

- 1. Section 26 0513 "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
- 2. Section 26 0519.13 "Undercarpet Electrical Power Cables" for flat cables for undercarpet installations.
- 3. Section 27 1500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control test reports.

SECTION 26 05 19  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

**PART 2 - PRODUCTS**

2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alcan Products Corporation; Alcan Cable Division.
  - 2. American Insulated Wire Corp.; a Leviton Company.
  - 3. General Cable Corporation.
  - 4. Senator Wire & Cable Company.
  - 5. Southwire Company.
- C. Copper Conductors: Comply with NEMA WC 70.
- D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- E. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC, metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the

SECTION 26 05 19  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

following:



SECTION 26 05 19  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

1. AFC Cable Systems, Inc.
  2. Hubbell Power Systems, Inc.
  3. O-Z/Gedney; EGS Electrical Group LLC.
  4. 3M; Electrical Products Division.
  5. Tyco Electronics Corp.
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

**PART 3 - EXECUTION**

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway. Underground feeder cable, Type UF may be used for site lighting.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

SECTION 26 05 19  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

SECTION 26 05 19  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

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 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 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 07 8413 "Penetration Firestopping."

SECTION 26 05 19  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform tests and inspections and prepare test reports.
- C. Tests and Inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.
    - a. Emergency System Feeders.
    - b. MEMA System Feeders.
  - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
    - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- D. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- E. Remove and replace malfunctioning units and retest as specified above.

**END OF SECTION**

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. UTP cabling.
- 2. 50/125-micrometer, multimode optical fiber cabling.
- 3. RS-232 cabling.
- 4. RS-485 cabling.
- 5. Low-voltage control cabling.
- 6. Control-circuit conductors.
- 7. Identification products.

1.3 DEFINITIONS

- A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
- B. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel section.
- C. EMI: Electromagnetic interference.
- D. IDC: Insulation displacement connector.
- E. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- F. 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.
- G. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- H. RCDD: Registered Communications Distribution Designer.
- I. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal side rails, and a bottom without ventilation openings.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

- J. 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.
- K. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
  - 1. Vertical and horizontal offsets and transitions.
  - 2. Clearances for access above and to side of cable trays.
  - 3. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
  - 4. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wire and cable to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of an NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. 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.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

- 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 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
  - 1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight.
  - 2. Test optical fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
  - 3. Test each pair of UTP cable for open and short circuits.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install UTP and optical fiber 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. Cable Trays:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cable Management Solutions, Inc.
    - b. Cablofil Inc.
    - c. Cooper B-Line, Inc.
    - d. Cope - Tyco/Allied Tube & Conduit.
    - e. GS Metals Corp.
  - 2. Cable Tray Materials: Metal, suitable for indoors and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than

PROJ. NO. 16228E-03-01  
260523-3

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

0.000472 inch (0.012 mm) thick.



SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

- a. Basket Cable Trays: 6 inches (150 mm) wide and 2 inches (50 mm) deep. Wire mesh spacing shall not exceed 2 by 4 inches (50 by 100 mm).
  - b. Trough or Ventilated Cable Trays: Nominally 6 inches (150 mm) wide.
  - c. Ladder Cable Trays: Nominally 18 inches (455 mm) wide, and a rung spacing of 12 inches (305 mm).
  - d. Channel Cable Trays: One-piece construction, nominally 4 inches (100 mm) wide. Slot spacing shall not exceed 4-1/2 inches (115 mm) o.c.
  - e. Solid-Bottom or Nonventilated Cable Trays: One-piece construction, nominally 12 inches (305 mm) wide. Provide with solid covers.
- C. Conduit and Boxes: Comply with requirements in Section 260533 "Raceways 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. Description: 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 Section 061000 "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. Berk-Tek; a Nexans company.
  3. CommScope, Inc.
  4. Draka USA.
  5. Genesis Cable Products; Honeywell International, Inc.
  6. KRONE Incorporated.
  7. Mohawk; a division of Belden CDT.
  8. Nordex/CDT; a subsidiary of Cable Design Technologies.
  9. Superior Essex Inc.
  10. SYSTIMAX Solutions; a CommScope, Inc. brand.
  11. 3M.
  12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. Description: 100-ohm, four-pair UTP, formed into 25-pair binder groups covered with a blue thermoplastic 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

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

with UL 444 and NFPA 70 for the following types:

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

- a. Communications, General Purpose: Type CM or Type CMG; or Type MPP, Type CMP, Type MPR, Type CMR, Type MP, or Type MPG.
- b. Communications, Plenum Rated: Type CMP or Type MPP, complying with NFPA 262.
- c. Communications, Riser Rated: Type CMR; or Type MPP, Type CMP, or Type MPR; complying with UL 1666.
- d. Communications, Limited Purpose: Type CMX; or Type MPP, Type CMP, Type MPR, Type CMR, Type MP, Type MPG, Type CM, or Type CMG.
- e. Multipurpose: Type MP or Type MPG; or Type MPP or Type MPR.
- f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
- g. Multipurpose, Riser Rated: Type MPR or Type MPP, complying with UL 1666.

2.4 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Technology Systems Industries, Inc.
  2. Dynacom Corporation.
  3. Hubbell Premise Wiring.
  4. KRONE Incorporated.
  5. Leviton Voice & Data Division.
  6. Molex Premise Networks; a division of Molex, Inc.
  7. Nordex/CDT; a subsidiary of Cable Design Technologies.
  8. Panduit Corp.
  9. Siemon Co. (The).
  10. 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 OPTICAL FIBER CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Berk-Tek; a Nexans company.
  2. CommScope, Inc.
  3. Corning Cable Systems.
  4. General Cable Technologies Corporation.
  5. Mohawk; a division of Belden CDT.
  6. Nordex/CDT; a subsidiary of Cable Design Technologies.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

7. Optical Connectivity Solutions Division; Emerson Network Power.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

8. Superior Essex Inc.
9. SYSTIMAX Solutions; a CommScope, Inc. brand.
10. 3M.
11. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: Multimode, 62.5/125-micrometer, 24 number-fiber, nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA/EIA-492AAAA-A for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
  - a. General Purpose, Nonconductive: Type OFN or OFNG, or Type OFNR or Type OFNP.
  - b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
  - c. Riser Rated, Nonconductive: Type OFNR or Type OFNP, complying with UL 1666.
  - d. General Purpose, Conductive: Type OFC or Type OFCG; or Type OFNG, Type OFN, Type OFCR, Type OFNR, Type OFCP, or Type OFNP.
  - e. Plenum Rated, Conductive: Type OFCP or Type OFNP, complying with NFPA 262.
  - f. Riser Rated, Conductive: Type OFCR; or Type OFNR, Type OFCP, or Type OFNP; complying with UL 1666.
5. Conductive cable shall be steel-armored type.
6. Maximum Attenuation: 3.5 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
7. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Orange for 62.5/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

## 2.6 OPTICAL FIBER CABLE HARDWARE

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

1. ADC.
2. American Technology Systems Industries, Inc.
3. Berk-Tek; a Nexans company.
4. Corning Cable Systems.
5. Dynacom Corporation.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

6. Hubbell Premise Wiring.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

7. Molex Premise Networks; a division of Molex, Inc.
8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Optical Connectivity Solutions Division; Emerson Network Power.
10. Siemon Co. (The).

B. Cable Connecting Hardware: Comply with the Fiber Optic Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.

1. Quick-connect, simplex and duplex, Type SC or Type ST connectors. Insertion loss not more than 0.75 dB.
2. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.7 RS-232 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.8 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM or Type CMG.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.



SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.9 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

C. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

D. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Plastic jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.10 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, Type THHN-THWN, in raceway or Type XHHN, in raceway or power-limited tray cable, in cable tray, complying with UL 83 & UL 44 where applicable.

PROJ. NO. 16228E-03-01  
260523-10

CONTROL-VOLTAGE ELECTRICAL POWER CABLES

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

2.11 IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of 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.
- C. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."

2.12 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. 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 Section 260533 "Raceways and Boxes for Electrical Systems" for installation of conduits and wireways.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

- D. Install manufactured conduit sweeps and long-radius elbows if possible.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

- E. Pathway Installation in Equipment Rooms:
1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed or in the corner of room if multiple sheets of plywood are installed around perimeter walls of room.
  2. Install cable trays to route cables if conduits cannot be located in these positions.
  3. Secure conduits to backboard if entering room from overhead.
  4. Extend conduits 3 inches (75 mm) above finished floor.
  5. 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. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
  4. 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.
  5. 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.
  6. 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.
  7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  8. 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. Install 110-style IDC termination hardware unless otherwise indicated.
  3. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- D. Installation of Control-Circuit Conductors:

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

1. Install wiring in raceways. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- E. Optical Fiber Cable Installation:
1. Comply with TIA/EIA-568-B.3.
  2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.
- F. 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.
- G. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
  2. Install cabling after the flooring system has been installed in raised floor areas.
  3. Coil cable 72 inches (1830 mm) long shall be neatly coiled not less than 12 inches (305 mm) in diameter below each feed point.
- H. 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 (305 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 (305 mm).

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

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 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables.

3.4 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.

3.5 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

- A. For data communication 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 Section 260526 "Grounding and Bonding for Electrical Systems."

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling according to TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 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. 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 after 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. Optical Fiber Cable Tests:
    - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    - b. Link End-to-End Attenuation Tests:
      - 1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
      - 2) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
- D. 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.

SECTION 260523  
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION

3.9



SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Grounding systems and equipment.
- B. Section includes grounding systems and equipment, plus the following special applications:
  - 1. Overhead-line grounding.
  - 2. Underground distribution grounding.
  - 3. Ground bonding common with lightning protection system.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
  - 1. Test wells.
  - 2. Ground rods.
  - 3. Ground rings.
  - 4. Grounding arrangements and connections for separately derived systems.
  - 5. Grounding for sensitive electronic equipment.
- B. Qualification Data: For qualified testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
  - 1. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, grounding connections for separately derived systems based on NETA MTS & NFPA 70B.
    - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
    - b. Include recommended testing intervals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA and/or NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

**PART 2 - PRODUCTS**

2.1 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-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 (6 mm) 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 (41 mm) wide and 1/16 inch (1.6 mm) thick.
  - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper

PROJ. NO. 16228E-03-01

260526-2

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- C. Bare Grounding Conductor and Conductor Protector for Wood Poles:
  - 1. No. 4 AWG minimum, soft-drawn copper.
  - 2. Conductor Protector: Half-round PVC or wood molding; if wood, use pressure-treated fir, cypress, or cedar.
  
- D. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
  
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.
  
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
  
- D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad
  
- B. Steel 3/4 inch by 10 feet (19 mm by 3 m) in diameter.
  
- C. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
  - 1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches (1200 mm) long.
  - 2. Backfill Material: Electrode manufacturer's recommended material.

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

**PART 3 - EXECUTION**

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
  - 1. Bury at least 24 inches (600 mm) below grade.
  - 2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.
- E. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
  - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING OVERHEAD LINES

- A. Comply with IEEE C2 grounding requirements.
- B. Install two parallel ground rods if resistance to ground by a single, ground-rod electrode exceeds 25 ohms.
- C. Drive ground rods until tops are 12 inches (300 mm) below finished grade in undisturbed earth.
- D. Ground-Rod Connections: Install bolted connectors for underground connections and connections to rods.

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- E. Lightning Arrester Grounding Conductors: Separate from other grounding conductors.

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- F. Secondary Neutral and Transformer Enclosure: Interconnect and connect to grounding conductor.
- G. Protect grounding conductors running on surface of wood poles with molding extended from grade level up to and through communication service and transformer spaces.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
  - 7. Armored and metal-clad cable runs.

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
  9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
  2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch (6.3-by-100-by-300-mm) grounding bus.
  3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- H. Metal or Wood Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.



SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
  - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
  - 1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- H. 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 (18 m) apart.
- I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
  2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.
- J. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet (6 m) 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.

3.6 LABELING

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.
- B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- C. Perform tests and inspections.

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells and at individual ground rods. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
  4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- E. Grounding system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
  2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
  3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
  5. Substations and Pad-Mounted Equipment: 5 ohms.
  6. Manhole Grounds: 10 ohms.
- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

**END**

## SECTION 26 05 29

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
  - 1. Section 26 0548 "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

##### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the

PROJ. NO. 16228E-03-01

260529-1

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEM

applied force.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel slotted support systems.
  - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze hangers. Include Product Data for components.
  - 2. Steel slotted channel systems. Include Product Data for components.
  - 3. Nonmetallic slotted channel systems. Include Product Data for components.
  - 4. Equipment supports.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

## 1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

## 1.8 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 07 7200 "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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:



2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
    - d. GS Metals Corp.
    - e. Thomas & Betts Corporation.
    - f. Unistrut; Tyco International, Ltd.
  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 requirements.
  6. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. Fabco Plastics Wholesale Limited.
  3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
  4. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
  5. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Hilti Inc.
      - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 3) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
  - 2. Mechanical-Expansion Anchors: 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 in which used.
    - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
      - 2) Empire Tool and Manufacturing Co., Inc.
      - 3) Hilti Inc.
      - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
  - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 6. Toggle Bolts: All-steel springhead type.
  - 7. Hanger Rods: Threaded steel.

## 2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PROJ. NO. 16228E-03-01  
260529-5

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEM

- 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 except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NEC.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other 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 two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- 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 (100 mm)

PROJ. NO. 16228E-03-01

260529-6

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEM

thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.

6. To Steel: Beam clamps (MSS 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 by means that meet seismic-restraint strength and anchorage requirements.

- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 05 5000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

### 3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 3053 "Miscellaneous Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
  1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### 3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Section 099113 "Exterior Painting", Section 099123 "Interior Painting" and Section 099600 "High Performance Coatings" 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**

## SECTION 26 05 33

### RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

###### A. 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.

###### B. Related Requirements:

1. Section 26 0543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Section 27 0528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.
3. Section 28 0528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

##### 1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PROJ. NO. 16228E-03-01  
260533-1

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

D. Samples: For wireways, nonmetallic wireways and surface raceways and for each color and texture specified, 12 inches (300 mm) long.

## 1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

## PART 2 - PRODUCTS

### 2.1 METAL CONDUITS, TUBING, AND FITTINGS

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

PROJ. NO. 16228E-03-01  
260533-2

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

1. AFC Cable Systems, Inc.
  2. Allied Tube & Conduit; a Tyco International Ltd. Co.
  3. Anamet Electrical, Inc.
  4. Electri-Flex Company.
  5. O-Z/Gedney; a brand of EGS Electrical Group.
  6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
  7. Republic Conduit.
  8. Robroy Industries.
  9. Southwire Company.
  10. Thomas & Betts Corporation.
  11. Western Tube and Conduit Corporation.
  12. Wheatland Tube Company; a division of John Maneely 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. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit or IMC.
1. Comply with NEMA RN 1.
  2. Coating Thickness: 0.040 inch (1 mm), minimum.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
  2. Fittings for EMT:
    - a. Material: Steel or die cast.
    - b. Type: Setscrew or compression.
  3. 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.
  4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.



- K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Anamet Electrical, Inc.
  - 3. Arco Corporation.
  - 4. CANTEX Inc.
  - 5. CertainTeed Corp.
  - 6. Condux International, Inc.
  - 7. Electri-Flex Company.
  - 8. Kraloy.
  - 9. Lamson & Sessions; Carlon Electrical Products.
  - 10. Niedax-Kleinhuis USA, Inc.
  - 11. RACO; a Hubbell company.
  - 12. Thomas & Betts Corporation.
- 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. Coilable 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.
- L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- M. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.
  - 2. Hoffman; a Pentair company.
  - 3. Mono-Systems, Inc.
  - 4. Square D; a brand of Schneider Electric.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R or Type 4 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 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Allied Moulded Products, Inc.
  - 2. Hoffman; a Pentair company.
  - 3. Lamson & Sessions; Carlon Electrical Products.
  - 4. Niedax-Kleinhuis USA, Inc.
- B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

- D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- G. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.5 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Mono-Systems, Inc.
    - b. Panduit Corp.
    - c. Wiremold / Legrand.
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from [manufacturer's standard] [custom] colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hubbell Incorporated; Wiring Device-Kellems Division.
    - b. Mono-Systems, Inc.
    - c. Panduit Corp.
    - d. Wiremold / Legrand.
- D. Tele-Power Poles:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Mono-Systems, Inc.

PROJ. NO. 16228E-03-01  
260533-6

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

- b. Panduit Corp.
  - c. Wiremold / Legrand.
2. Material: Galvanized steel with ivory baked-enamel finish
  3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

## 2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Adalet.
  2. Cooper Technologies Company; Cooper Crouse-Hinds.
  3. EGS/Appleton Electric.
  4. Erickson Electrical Equipment Company.
  5. Hoffman; a Pentair company.
  6. Hubbell Incorporated; Killark Division.
  7. Milbank Manufacturing Co.
  8. Mono-Systems, Inc.
  9. O-Z/Gedney; a brand of EGS Electrical Group.
  10. RACO; a Hubbell Company.
  11. Spring City Electrical Manufacturing Company.
  12. Thomas & Betts Corporation.
  13. 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 aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
  1. Material: Cast metal or sheet metal.
  2. Type: Semi-adjustable.
  3. Shape: Rectangular.
  4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- I. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).
1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- J. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- L. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- M. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- N. Gangable boxes are prohibited.
- O. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R or Type 4 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.
- P. Cabinets:
1. NEMA 250, Type 1, Type 3R or Type 4 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  2. Hinged door in front cover with flush latch and concealed hinge.
  3. Key latch to match panelboards.
  4. Metal barriers to separate wiring of different systems and voltage.
  5. Accessory feet where required for freestanding equipment.
  6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:

PROJ. NO. 16228E-03-01  
260533-8

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
  2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide products as indicated on drawings or comparable product by one of the following:
    - a. Armorcast Products Company.
    - b. Carson Industries LLC.
    - c. CDR Systems Corporation; Hubbell Power Systems.
    - d. NewBasis.
    - e. Oldcastle Precast, Inc.; Christy Concrete Products.
    - f. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
  3. Standard: Comply with SCTE 77.
  4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
  5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  7. Cover Legend: Molded lettering, "ELECTRIC."
  8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
  9. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete or fiberglass.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Armorcast Products Company.
    - b. Carson Industries LLC.
    - c. CDR Systems Corporation; Hubbell Power Systems.
    - d. NewBasis.
    - e. Nordic Fiberglass, Inc.
    - f. Oldcastle Precast, Inc.; Christy Concrete Products.
    - g. Synertech Moulded Products; a division of Oldcastle Precast, Inc.

3. Standard: Comply with SCTE 77.
4. Color of Frame and Cover: Gray.
5. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
6. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
7. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
8. Cover Legend: Molded lettering, "ELECTRIC."
9. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
10. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

## 2.8 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
  1. Tests of materials shall be performed by an independent testing agency.
  2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
  3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  1. Exposed Conduit: GRC or IMC.
  2. Concealed Conduit, Aboveground RNC, Type EPC-40-PVC or EMT.
  3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried or concrete encased.
  4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or Type 4.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
  1. Exposed, Not Subject to Physical Damage: EMT, ENT or RNC.
  2. Exposed, Not Subject to Severe Physical Damage: EMT or RNC identified for such use.
  3. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:
    - a. Loading dock.

- b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
  - c. Mechanical rooms.
  - d. Gymnasiums.
4. Concealed in Ceilings and Interior Walls and Partitions: ENT.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  6. Damp or Wet Locations: GRC or IMC.
  7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
  4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- G. Install surface raceways only where indicated on Drawings.
- H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C)

### 3.2 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 NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) 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.

PROJ. NO. 16228E-03-01  
260533-11

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS



- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- I. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
  - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
  - 5. Change from ENT to RNC, Type EPC-40-PVC, GRC or IMC before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
  - 1. Use EMT, IMC, or RMC for raceways.
  - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. 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.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. 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 (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

- P. 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.
- Q. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
  2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where an underground service raceway enters a building or structure.
  3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- W. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
  2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.

- c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
  - d. Attics: 135 deg F (75 deg C temperature change).
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
  4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
  2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- Y. 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 bottom of box unless otherwise indicated.
- Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. 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.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

### 3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:

PROJ. NO. 16228E-03-01  
260533-14

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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 (150 mm) 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 (300 mm) 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 duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
  - b. 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 (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits but a minimum of 6 inches (150 mm) below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

### 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.
- D. Install handholes with bottom below frost line below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm

lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### 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**

## SECTION 26 05 44

### SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

###### A. Section Includes:

1. 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 07 8413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

##### 1.3 ACTION SUBMITTALS

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

###### B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 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 Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

#### C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

#### D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

#### E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

#### F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:
  - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
  - b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

### 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, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Advance Products & Systems, Inc.
  - b. CALPICO, Inc.
  - c. Metraflex Company (The).

PROJ. NO. 16228E-03-01

260544-2

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

- d. Pipeline Seal and Insulator, Inc.
  - e. Proco Products, Inc.
3. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  4. Pressure Plates: Stainless steel.
  5. Connecting Bolts and Nuts: Stainless steel 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.
  1. Manufacturers: Subject to compliance with requirements provide products by one of the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable.

### 2.4 GROUT

- A. Description: Nonshrink; 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 (34.5-MPa), 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.
  2. Sealant shall have VOC content in according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PROJ. NO. 16228E-03-01

260544-3

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING



## 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 (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
  - 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 (50 mm) 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 pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) 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 (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

PROJ. NO. 16228E-03-01

260544-4

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

### 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**

## SECTION 26 05 53

### IDENTIFICATION FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Identification for raceways.
  - 2. Identification of power and control cables.
  - 3. Identification for conductors.
  - 4. Underground-line warning tape.
  - 5. Warning labels and signs.
  - 6. Instruction signs.
  - 7. Equipment identification labels.
  - 8. Miscellaneous identification products.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

##### 1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.

PROJ. NO. 16228E-03-01

260553-1

IDENTIFICATION FOR ELECTRICAL SYSTEMS

- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

## 1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage and system or service type.
- C. Colors for Raceways Carrying Circuits at More Than 600 V:
  - 1. Black letters on an orange field.
  - 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.
- D. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

PROJ. NO. 16228E-03-01

260553-2

IDENTIFICATION FOR ELECTRICAL SYSTEMS

- G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers diagonally over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stop stripes at legends.
- H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.
- I. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

## 2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage and system or service type.
- C. Colors for Raceways Carrying Circuits at More Than 600 V:
  - 1. Black letters on an orange field.
  - 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.
- D. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- E. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

## 2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

- C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.
- D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- E. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

#### 2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- F. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
  - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

## 2.5 FLOOR MARKING TAPE

- A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

## 2.6 UNDERGROUND-LINE WARNING TAPE

### A. Tape:

- 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
- 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
- 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

### B. Color and Printing:

- 1. Comply with ANSI Z535.1 through ANSI Z535.5.
- 2. Inscriptions for Red-Colored Tapes: **ELECTRIC LINE, HIGH VOLTAGE.**
- 3. Inscriptions for Orange-Colored Tapes: **TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.**

### C. Tag: Type I:

- 1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
- 2. Thickness: 4 mils (0.1 mm).
- 3. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
- 4. 3-Inch (75-mm) Tensile According to ASTM D 882: 30 lbf (133.4 N), and 2500 psi (17.2 MPa).

### D. Tag: Type II:

- 1. Multilayer laminate consisting of high-density polyethylene scrim coated with pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
- 2. Thickness: 12 mils (0.3 mm).
- 3. Weight: 36.1 lb/1000 sq. ft. (17.6 kg/100 sq. m).
- 4. 3-Inch (75-mm) Tensile According to ASTM D 882: 400 lbf (1780 N), and 11,500 psi (79.2 MPa).

### E. Tag: Type ID

- 1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

2. Overall Thickness: 5 mils (0.125 mm).
3. Foil Core Thickness: 0.35 mil (0.00889 mm).
4. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
5. 3-Inch (75-mm) Tensile According to ASTM D 882: 70 lbf (311.3 N), and 4600 psi (31.7 MPa).

F. Tag: Type IID:

1. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 8 mils (0.2 mm).
3. Foil Core Thickness: 0.35 mil (0.00889 mm).
4. Weight: 34 lb/1000 sq. ft. (16.6 kg/100 sq. m).
5. 3-Inch (75-mm) Tensile According to ASTM D 882: 300 lbf (1334 N), and 12,500 psi (86.1 MPa).

## 2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."



2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

## 2.8 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
  1. Engraved legend with black letters on white face.
  2. Punched or drilled for mechanical fasteners.
  3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

## 2.9 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.
- C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- E. Stenciled Legend: In nonfading, waterproof, **black** ink or paint. Minimum letter height shall be **1 inch (25 mm)**.

## 2.10 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
  1. Minimum Width: 3/16 inch (5 mm).

2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
  3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  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 (5 mm).
  2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
  3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
1. Minimum Width: 3/16 inch (5 mm).
  2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
  3. UL 94 Flame Rating: 94V-0.
  4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
  5. Color: Black.

## 2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finishwork.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.
- I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
- J. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

### 3.2 IDENTIFICATION SCHEDULE

- A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:
  - 1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
  - 2. Wall surfaces directly external to raceways concealed within wall.
  - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot (3-m) maximum intervals.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120V to ground: Identify with self-adhesive vinyl label labels at 10-foot (3-m) maximum intervals.

- D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
1. Emergency Power.
  2. Power.
- E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
    - c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- F. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.
- G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- H. Conductors to Be Extended in the Future: Attach **[write-on tags]** **[marker tape]** to conductors and list source.
- I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- J. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
  2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- K. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
1. Comply with 29 CFR 1910.145.
  2. Identify system voltage with black letters on an orange background.
  3. Apply to exterior of door, cover, or other access.
  4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
    - a. Power transfer switches.
    - b. Controls with external control power connections.
- M. 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.
- N. Emergency Operating Instruction Signs: 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.
- O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
    - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) 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 provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:
  - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
  - b. Enclosures and electrical cabinets.
  - c. Access doors and panels for concealed electrical items.
  - d. Switchgear.
  - e. Switchboards.
  - f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
  - g. Substations.
  - h. Emergency system boxes and enclosures.
  - i. Motor-control centers.
  - j. Enclosed switches.
  - k. Enclosed circuit breakers.
  - l. Enclosed controllers.
  - m. Variable-speed controllers.
  - n. Push-button stations.
  - o. Power transfer equipment.
  - p. Contactors.
  - q. Remote-controlled switches, dimmer modules, and control devices.
  - r. Battery-inverter units.
  - s. Battery racks.
  - t. Power-generating units.
  - u. Monitoring and control equipment.
  - v. UPS equipment.

**END OF SECTION**

## SECTION 26 05 73

### OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes computer-based, fault-current and overcurrent protective device coordination studies. Protective devices shall be set based on results of the protective device coordination study.
  - 1. Coordination of series-rated devices is permitted where indicated on Drawings.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Other Action Submittals: The following submittals shall be made after the approval process for system protective devices has been completed. Submittals shall be in digital form.
  - 1. Coordination-study input data, including completed computer program input data sheets.
  - 2. Study and Equipment Evaluation Reports.
  - 3. Coordination-Study Report.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For coordination-study specialist.
- B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.

##### 1.5 QUALITY ASSURANCE

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

PROJ. NO. 16228E-03-01

260573-1

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

- B. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
  - 1. Professional engineer, licensed in the state where Project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.
- C. Comply with IEEE 242 for short-circuit currents and coordination time intervals.
- D. Comply with IEEE 399 for general study procedures.

## **PART 2 - PRODUCTS**

### 2.1 COMPUTER SOFTWARE DEVELOPERS

- A. Available Computer Software Developers: Subject to compliance with requirements, companies offering computer software programs that may be used in the Work include, but are not limited to, the following:
- B. Computer Software Developers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
  - 1. CGI CYME.
  - 2. EDSA Micro Corporation.
  - 3. ESA Inc.
  - 4. Operation Technology, Inc.
  - 5. SKM Systems Analysis, Inc.

### 2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

- A. Comply with IEEE 399.
- B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
  - 1. Optional Features:

PROJ. NO. 16228E-03-01  
260573-2

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY



- a. Arcing faults.
- b. Simultaneous faults.
- c. Explicit negative sequence.
- d. Mutual coupling in zero sequence.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.
  - 1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

### **3.2 POWER SYSTEM DATA**

- A. Gather and tabulate the following input data to support coordination study:
  - 1. Product Data for overcurrent protective devices specified in other electrical Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
  - 2. Impedance of utility service entrance.
  - 3. Electrical Distribution System Diagram: In hard-copy and electronic-copy formats, showing the following:
    - a. Circuit-breaker and fuse-current ratings and types.
    - b. Relays and associated power and current transformer ratings and ratios.
    - c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
    - d. Generator kilovolt amperes, size, voltage, and source impedance.
    - e. Cables: Indicate conduit material, sizes of conductors, conductor material, insulation, and length.
    - f. Busway ampacity and impedance.
    - g. Motor horsepower and code letter designation according to NEMA MG 1.
  - 4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

- a. Special load considerations, including starting inrush currents and frequent starting and stopping.
- b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
- c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
- d. Generator thermal-damage curve.
- e. Ratings, types, and settings of utility company's overcurrent protective devices.
- f. Special overcurrent protective device settings or types stipulated by utility company.
- g. Time-current-characteristic curves of devices indicated to be coordinated.
- h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
- i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
- j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

### 3.3 FAULT-CURRENT STUDY

- A. Calculate the maximum available short-circuit current in amperes rms symmetrical at circuit-breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:
  1. VFD-controllers.
  2. Distribution panelboard.
  3. Branch circuit panelboard.
- B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.
- C. Calculate momentary and interrupting duties on the basis of maximum available fault current.
- D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with IEEE 141 and IEEE 242.
  1. Transformers:
    - a. ANSI C57.12.10.
    - b. ANSI C57.12.22.
    - c. ANSI C57.12.40.
    - d. IEEE C57.12.00.
    - e. IEEE C57.96.

PROJ. NO. 16228E-03-01  
260573-4

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

2. Medium-Voltage Circuit Breakers: IEEE C37.010.
3. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.20.1.
4. Low-Voltage Fuses: IEEE C37.46.

E. Study Report:

1. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.

F. Equipment Evaluation Report:

1. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
2. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

### 3.4 COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Comply with **IEEE 141, IEEE 241 and IEEE 242** recommendations for fault currents and time intervals.

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:
  - a. Inrush current when first energized.
  - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
  - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Motors served by voltages more than 600 V shall be protected according to IEEE 620.

PROJ. NO. 16228E-03-01  
260573-5

OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

- E. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
  
- F. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:
  - 1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
    - a. Device tag.
    - b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
    - c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
    - d. Fuse-current rating and type.
    - e. Ground-fault relay-pickup and time-delay settings.
  
  - 2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
    - a. Device tag.
    - b. Voltage and current ratio for curves.
    - c. Three-phase and single-phase damage points for each transformer.
    - d. No damage, melting, and clearing curves for fuses.
    - e. Cable damage curves.
    - f. Transformer inrush points.
    - g. Maximum fault-current cutoff point.
  
- G. Completed data sheets for setting of overcurrent protective devices.

**END OF SECTION**

## SECTION 26 22 00

### LOW-VOLTAGE TRANSFORMERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
  - 1. Distribution transformers.
  - 2. Buck-boost transformers.

##### 1.2 SUBMITTALS

- A. Product Data: For each product specified.
- B. Shop Drawings: Indicate dimensions and weights.
  - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Division 16 Section "Electrical Supports and Seismic Restraints."
- D. Field quality-control test reports.
- E. Operation and maintenance data.

##### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Products.
  - 2. General Electric Company..
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; Schneider Electric.

### **2.2 GENERAL TRANSFORMER REQUIREMENTS**

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices except for taps.
  - 1. Internal Coil Connections: Brazed or pressure type.
  - 2. Coil Material: Copper.

### **2.3 DISTRIBUTION TRANSFORMERS**

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561.
- B. Provide transformers that are constructed to withstand seismic forces specified in Division 16 Section "Electrical Supports and Seismic Restraints."
- C. Cores: One leg per phase.
- D. Enclosure: Ventilated, NEMA 250, Type 2.
  - 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- E. Enclosure: Ventilated
  - 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- F. Transformer Enclosure Finish: Comply with NEMA 250.
  - 1. Finish Color ANSI 49 gray.

- G. Taps for Transformers Smaller Than 3 kVA: One 5 percent tap above normal full capacity.
- H. Taps for Transformers 7.5 to 24 kVA: Two 5 percent taps below rated voltage.
- I. Taps for Transformers 25 kVA and Larger Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.
- J. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.
- K. Energy Efficiency for Transformers Rated 15 kVA and Larger:
  - 1. Complying with NEMA TP 1, Class 1 efficiency levels.
  - 2. Tested according to NEMA TP 2.
- L. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
  - 1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
  - 2. Indicate value of K-factor on transformer nameplate.
- M. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
- N. Wall Brackets: Manufacturer's standard brackets.

#### 2.4 BUCK-BOOST TRANSFORMERS

- A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.
- B. Enclosure: Ventilated, NEMA 250, Type 2.
  - 1. Finish Color: ANSI 49 gray.

#### 2.5 IDENTIFICATION DEVICES

- A. Nameplates: Engraved, laminated-plastic or metal nameplate. Nameplates are specified in Division 16 Section "Electrical Identification."

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
  - 1. Brace wall-mounting transformers as specified in Division 16 Section "Electrical Supports and Seismic Restraints."
- B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions or codes applicable to Project and requirements in Division 16 Section.

### **3.2 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. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
    - a. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
    - b. Perform 2 follow-up infrared scans of transformers, one at 4 months and the other at 11 months after Substantial Completion.
    - c. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

### **3.3 ADJUSTING**

- A. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
- B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.
- C. Output Settings Report: Prepare a written report recording output voltages and tap settings.



**END OF SECTION**

PROJ. NO. 16228E-03-01  
262200-5  
LOW-VOLTAGE TRANSFORMERS

## SECTION 26 24 16

### PANELBOARDS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.
  - 3. Load centers.
  - 4. Electronic-grade panelboards.

##### 1.3 DEFINITIONS

- A. SVR: Suppressed voltage rating.
- B. TVSS: Transient voltage surge suppressor.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

##### 1.5 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.

- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
  - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 5. Include evidence of NRTL listing for series rating of installed devices.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.
  - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field Quality-Control Reports:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components 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 overcurrent protective devices.
  - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Keys: Two spares for each type of panelboard cabinet lock.
  - 2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.
  - 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  - 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

## 1.9 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NEMA PB 1.
- F. Comply with NFPA 70.

## 1.10 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.

#### 1.11 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 minus 22 deg F (minus 30 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).
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Architect and owner no fewer than two weeks in advance of proposed interruption of electric service.
  - 2. Do not proceed with interruption of electric service without Owner's or Construction Manager's written permission.
  - 3. Comply with NFPA 70E.

#### 1.12 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 anchorbolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

#### 1.13 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 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 0548 "Vibration and Seismic Controls for Electrical Systems." B. Enclosures: Flush- and surface-mounted cabinets.

- 1. Rated for environmental conditions at installed location.
  - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
  - b. Outdoor Locations: NEMA 250, Type 3R.
  - c. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
  - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
- 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- 4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
- 5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
- 6. Finishes:
  - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
  - b. Back Boxes: Galvanized steel.

- c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
- 7. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
- C. Incoming Mains Location Top and bottom.
- D. Phase, Neutral, and Ground Buses:
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  - 3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
  - 4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
  - 5. Split Bus: Vertical buses divided into individual vertical sections.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Tin-plated aluminum.
  - 2. Main and Neutral Lugs: Mechanical type.
  - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
  - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
  - 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
  - 6. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
  - 7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extracapacity neutral bus.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

- I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

## 2.2 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product as manufactured by Square D / Schneider Electric or comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
- C. Panelboards: NEMA PB 1, power and feeder distribution type.
- D. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
  - 1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike. E.

Mains: Circuit breaker or Lugs only as indicated on the drawings.

- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- H. Branch Overcurrent Protective Devices: Fused switches.
- I. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
  - 1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
  - 2. External Control-Power Source: 24-V control circuit.

## 2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

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



- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- D. Mains: Circuit breaker or lugs only as indicated on the drawings.
- E. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- F. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
  2. External Control-Power Source: 24-V control circuit.
- G. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- H. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

## 2.4 ELECTRONIC-GRADE PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Current Technology; a subsidiary of Danahar Corporation.
  2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  4. Siemens Energy & Automation, Inc.
  5. Square D; a brand of Schneider Electric.
- C. Panelboards: NEMA PB 1; with factory-installed, integral TVSS; labeled by an NRTL for compliance with UL 67 after installing TVSS.

- D. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- E. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.
- F. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.
- G. Buses:
  - 1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
  - 2. Copper equipment and isolated ground buses.
- H. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, wired-in or bolt-on, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, short-circuit current rating complying with UL 1449, second edition, and matching or exceeding the panelboard short-circuit rating, redundant suppression circuits, with individually fused metal-oxide varistors.
  - 1. Accessories:
    - a. Fuses rated at 200-kA interrupting capacity.
    - b. Fabrication using bolted compression lugs for internal wiring.
    - c. Integral disconnect switch.
    - d. Redundant suppression circuits.
    - e. Redundant replaceable modules.
    - f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
    - g. LED indicator lights for power and protection status.
    - h. Audible alarm, with silencing switch, to indicate when protection has failed.
    - i. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
    - j. Four-digit, transient-event counter set to totalize transient surges.
  - 2. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.
  - 3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.
    - a. Line to Neutral: 70,000A.
    - b. Line to Ground: 70,000A.
    - c. Neutral to Ground: 50,000A.
  - 4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.

5. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 -V, three-phase, four-wire circuits shall be as follows:
  - a. Line to Neutral: 800 V for 480Y/277.
  - b. Line to Ground: 800 V for 480Y/277.
  - c. Neutral to Ground: 800 V for 480Y/277.
6. Protection modes and UL 1449 SVR for 240/120-V, three-phase, four-wire circuits with high leg shall be as follows:
  - a. Line to Neutral: 400 V, 800 V from high leg.
  - b. Line to Ground: 400 V.
  - c. Neutral to Ground: 400 V.
7. Protection modes and UL 1449 SVR for 240-, 480-, or 600-V, three-phase, three-wire, delta circuits shall be as follows:
  - a. Line to Line: 2000 V for 480 V.
  - b. Line to Ground: 1500 V for 480 V.

## 2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- C. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
  1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with frontmounted, field-adjustable trip setting.
  3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and the following field-adjustable settings:

- a. Instantaneous trip.
  - b. Long- and short-time pickup levels.
  - c. Long- and short-time time adjustments.
  - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
  6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
  7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240V, single-pole configuration.
  8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Lugs Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    - e. Communication Capability: Universal-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
    - f. Shunt Trip: 24-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
    - g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
    - h. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuitbreaker contacts.
    - i. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
    - j. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
    - k. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
    - l. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    - m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.

- n. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- D. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- 1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."
  - 2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.
  - 3. Auxiliary Contacts: One normally open and normally closed contact(s) that operate with switch handle operation.

## 2.6 PANELBOARD SUPPRESSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
- 1. Current Technology; a subsidiary of Danahar Corporation.
  - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  - 4. Siemens Energy & Automation, Inc.
  - 5. Square D; a brand of Schneider Electric.
- C. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, solid-state, parallel-connected, non-modular type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:
- 1. Accessories:
    - a. LED indicator lights for power and protection status.
    - b. Audible alarm, with silencing switch, to indicate when protection has failed.
    - c. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.
- D. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, wired-in or bolt-on, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the panelboard short-circuit rating, and with the following features and accessories:
- 1. Accessories:
    - a. Fuses rated at 200-kA interrupting capacity.

- b. Fabrication using bolted compression lugs for internal wiring.
  - c. Integral disconnect switch.
  - d. Redundant suppression circuits.
  - e. Redundant replaceable modules.
  - f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
  - g. LED indicator lights for power and protection status.
  - h. Audible alarm, with silencing switch, to indicate when protection has failed.
  - i. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
  - j. Four-digit, transient-event counter set to totalize transient surges.
2. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.
3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.
- a. Line to Neutral: 70,000A.
  - b. Line to Ground: 70,000A.
  - c. Neutral to Ground: 50,000A.
4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.
5. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277-V, three-phase, four-wire circuits shall be as follows:
- a. Line to Neutral: 800 V for 480Y/277.
  - b. Line to Ground: 800 V for 480Y/277.
  - c. Neutral to Ground: 800 V for 480Y/277.
6. Protection modes and UL 1449 SVR for 240/120-V, single-phase, three-wire circuits shall be as follows:
- a. Line to Neutral: 400 V.
  - b. Line to Ground: 400 V.
  - c. Neutral to Ground: 400 V.
7. Protection modes and UL 1449 SVR for 240/120-V, three-phase, four-wire circuits with high leg shall be as follows:
- a. Line to Neutral: 400 V, 800 V from high leg.
  - b. Line to Ground: 400 V.
  - c. Neutral to Ground: 400 V.

8. Protection modes and UL 1449 SVR for 240-, 480-, or 600-V, three-phase, three-wire, delta circuits shall be as follows:

- a. Line to Line: 2000 V for 480 V.
- b. Line to Ground: 1500 V for 480 V.

## 2.7 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

## 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. Install panelboards and accessories according to NECA 407.
- B. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Section 03 3000 "Cast-inPlace 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 full perimeter of base.
  - 2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  4. Install anchor bolts to elevations required for proper attachment to panelboards.
  5. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- D. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- E. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- F. 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. G. Install overcurrent protective devices and controllers not already factory installed.
1. Set field-adjustable, circuit-breaker trip ranges. H.

Install filler plates in unused spaces.

- I. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- K. Comply with NECA 1.

### 3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."



- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. C. Perform tests and inspections.

- 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

- D. Acceptance Testing Preparation:

- 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
- 2. Test continuity of each circuit. E. Tests and

#### Inspections:

- 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- 3. Perform the following infrared scan tests and inspections and prepare reports:
  - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
  - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
  - c. Instruments and Equipment:
    - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

- F. Panelboards will be considered defective if they do not pass tests and inspections.

- G. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.5 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
  - 1. Measure as directed during period of normal system loading.
  - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
  - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
  - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

### 3.6 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

## SECTION 26 27 26

### WIRING DEVICES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge-suppression units.
4. Isolated-ground receptacles.
5. Hospital-grade receptacles.
6. Tamper-resistant receptacles.
7. Weather-resistant receptacles.
8. Snap switches and wall-box dimmers.
9. Solid-state fan speed controls.
10. Wall-switch and exterior occupancy sensors.
11. Communications outlets.
12. Pendant cord-connector devices.
13. Cord and plug sets.
14. Floor service outlets, poke-through assemblies, service 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. TVSS: Transient voltage surge suppressor.

PROJ. NO. 16228E-03-01

262726-1

WIRING DEVICES

F. UTP: Unshielded twisted pair.

#### 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. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

#### 1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

#### 1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

#### 1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Service-Outlet Assemblies: One for every 10.
2. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed.
3. TVSS Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
  2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
  3. Leviton Mfg. Company Inc. (Leviton).
  4. Pass & Seymour/Legrand (Pass & Seymour).
- B. 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.

## 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.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 5351 (single), CR5362 (duplex).
    - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
    - c. Leviton; 5891 (single), 5352 (duplex).
    - d. Pass & Seymour; 5361 (single), 5362 (duplex).
- B. Hospital-Grade, Duplex 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.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 8310 (single), 8300 (duplex).
    - b. Hubbell; HBL8310 (single), HBL8300 (duplex).
    - c. Leviton; 8310 (single), 8300 (duplex).
    - d. Pass & Seymour; 8301 (single), 8300H (duplex).

2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickelplated, brass mounting strap.
- 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. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; IG5362RN.
    - b. Hubbell; IG5362.
    - c. Leviton; 5362-IG.
    - d. Pass & Seymour; IG5362.
  2. 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.
- 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.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; TR8300.
    - b. Hubbell; HBL8300SGA.
    - c. Leviton; 8300-SGG.
    - d. Pass & Seymour; TR63H.
  2. Description: Labeled shall comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

## 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.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; VGF20.

- b. Hubbell; GFR5352L.
  - c. Pass & Seymour; 2095.
  - d. Leviton; 7590.
- C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Hubbell; GFTR20.
    - b. Pass & Seymour; 2095TR.

## 2.5 TVSS RECEPTACLES

- A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS WC-596, with integral TVSS in line to ground, line to neutral, and neutral to ground.
- 1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
  - 2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

### B. Duplex TVSS Convenience Receptacles:

- 1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Cooper; 5362BLS.
  - b. Hubbell; HBL5362SA.
  - c. Leviton; 5380.
  - d. Pass & Seymour; 5362BLSP.

- 2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.

### Isolated-Ground, Duplex Convenience Receptacles:

- 1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Cooper; IG5362BLS.
  - b. Hubbell; IG5362SA.
  - c. Leviton; 5380-IG.
  - d. Pass & Seymour; IG5362BLSP.
- 2. Description:
  - a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
  - 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.

D. Isolated-Ground, Hospital-Grade, Duplex Convenience Receptacles:

1. Products: Subject to compliance with requirements provide one of the following:
  - a. Cooper; IG8300HGBLS.
  - b. Hubbell; IG8362SA.
  - c. Leviton; 8380-IG.
  - d. Pass & Seymour; IG8300BLSP.
2. Description:
  - a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
  - b. Comply with UL 498 Supplement sd.
  - c. 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 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

A. **Available** Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

1. Manufacturers: Subject to compliance with requirements:
2. Basis-of-Design Product: Subject to compliance with requirements, provide provide one of the following or comparable product by one of the following:
  - a. Cooper Crouse-Hinds.
  - b. EGS/Appleton Electric.
  - c. Killark; Division of Hubbell Inc.

## 2.7 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.

1. Products: Subject to compliance with requirements provide one of the following:
  - a. Cooper; CWL520R.
  - b. Hubbell; HBL2310.
  - c. Leviton; 2310.
  - d. Pass & Seymour; L520-R.



B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; IGL520R.
- b. Hubbell; IG2310.
- c. Leviton; 2310-IG.
- d. Pass & Seymour; IG4700.

2. 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.

2.8 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.

2.9 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.

2.10 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
  - 1. Products: Non System switches shall be in compliance with requirements provide one of the following:
    - 1) Single Pole:
      - a) Cooper; AH1221.
      - b) Hubbell; HBL1221.
      - c) Leviton; 1221-2.
      - d) Pass & Seymour; CSB20AC1.
    - 2) Two Pole:
      - a) Cooper; AH1222.
      - b) Hubbell; HBL1222.
      - c) Leviton; 1222-2.
    - 3) Three Way:
      - a) Cooper; AH1223.
      - b) Hubbell; HBL1223.
      - c) Leviton; 1223-2.
      - d) Pass & Seymour; CSB20AC3.
    - 4) Four Way:
      - a) Cooper; AH1224.
      - b) Hubbell; HBL1224.
      - c) Leviton; 1224-2.
      - d) Pass & Seymour; CSB20AC4. C.

Pilot-Light Switches, 20 A:

- 1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Cooper; AH1221PL for 120 and 277 V.
  - b. Hubbell; HBL1201PL for 120 and 277 V.
  - c. Leviton; 1221-LH1.
  - d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
- 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off." D.

Key-Operated Switches, 120/277 V, 20 A:

- 1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Cooper; AH1221L.

- b. Hubbell; HBL1221L.
  - c. Leviton; 1221-2L.
  - d. Pass & Seymour; PS20AC1-L.
- 2. Description: Single pole, with factory-supplied key in lieu of switch handle.
- E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 1995.
    - b. Hubbell; HBL1557.
    - c. Leviton; 1257.
    - d. Pass & Seymour; 1251.
- F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 1995L.
    - b. Hubbell; HBL1557L.
    - c. Leviton; 1257L.
    - d. Pass & Seymour; 1251L.

## 2.11 DECORATOR-STYLE DEVICES

- A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 6252.
    - b. Hubbell; DR15.
    - c. Leviton; 16252.
    - d. Pass & Seymour; 26252.
- B. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; TR6252.

- b. Hubbell; DR15TR.
  - c. Pass & Seymour; TR26252.
- 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- C. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; TWRBR15.
    - b. Hubbell; DR15TR.
    - c. LevitonTRW15.
    - d. Pass & Seymour; TRW26252.
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.
- D. GFCI, Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; VGF15.
    - b. Hubbell; GF15LA.
    - c. Leviton; 8599.
    - d. Pass & Seymour; 1594.
- E. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; TWRVGF15.
    - b. Hubbell; GFTR15.
    - c. Pass & Seymour; 1594TRWR.
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- F. Non System Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.

1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 7621 (single pole), 7623 (three way).
    - b. Hubbell; DS115 (single pole), DS315 (three way).
    - c. Leviton; 5621-2 (single pole), 5623-2 (three way).
    - d. Pass & Seymour; 2621 (single pole), 2623 (three way).
- G. Non System Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 7631 (single pole), 7633 (three way).
    - b. Hubbell; DS120IL (single pole), DS320 (three way).
    - c. Leviton; 5631-2 (single pole), 5633-2 (three way).
    - d. Pass & Seymour; 2625 (single pole), 2626 (three way).
  2. Description: With neon-lighted handle, illuminated when switch is "off."

## 2.12 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable toggle; with single-pole or three-way switching. Comply with UL 1472.

## 2.13 WALL PLATES

- A. Single and combination type wall plates for ALL wiring devices shall be **Stainless Steel** and shall match corresponding wiring devices.
  1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Material for Finished Spaces: Stainless Steel with polished finish.
  3. Material for Unfinished Spaces: Stainless Steel with polished finish.
  4. Material for Damp Locations: Stainless Steel with polished finish Thermal plastic, spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weatherresistant, Stainless Steel with polished finish and lockable cover.

## 2.14 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Round solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

#### 2.15 POKE-THROUGH ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand.
3. Square D/Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold/Legrand. C. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
3. Service-Outlet Assembly: Flush type with two simplex receptacles and space for two RJ45 jacks or Flush type with four simplex receptacles and space for four RJ-45 jacks as required to meet the design and complying with requirements in Section 27 15 00 "Communications Horizontal Cabling."
4. Size: Selected to fit nominal 3-inch (75-mm) cored holes in floor and matched to floor thickness.
5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
6. Closure Plug: Arranged to close unused 3-inch (75-mm) cored openings and reestablish fire rating of floor.
7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of two, four-pair cables that comply with requirements in Section 271500 "Communications Horizontal Cabling."

#### 2.16 PREFABRICATED MULTIOUTLET ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold/Legrand. C. 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.

D. Raceway Material: Metal, with manufacturer's standard finish.

E. Multioutlet 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: 12 inches (300 mm).
3. Wiring: No. 12 AWG solid, Type THHN copper, two circuit, connecting alternating receptacles.

## 2.17 SERVICE POLES

A. Description:

1. Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
2. Poles: Nominal 2.5-inch- (65-mm-) square cross section, with height adequate to extend from floor to at least 6 inches (150 mm) above ceiling, and with separate channels for power wiring and voice and data communication cabling.
3. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
4. Finishes: Manufacturer's standard painted finish and trim combination.
5. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, four-pair, Category 3 or Category 5 voice and data communication cables.
6. Power Receptacles: Two duplex, 20-A, straight-blade receptacles complying with requirements in this Section.

## 2.18 FINISHES A.

Device Color:

1. Wiring Devices Connected to Normal Power System: Almond or Ivory As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System As selected by Architect .
3. TVSS Devices: Blue.
4. Isolated-Ground Receptacles: As specified above, with orange triangle on face. B.

Wall Plate Color: Stainless Steel with polished finish covers.

## PART 3 - EXECUTION

PROJ. NO. 16228E-03-01

262726-13

WIRING DEVICES

### 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 device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete. C.

#### Conductors:

- 1. Do not strip insulation from conductors until 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. Pigtailling 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 (152 mm) 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.

PROJ. NO. 16228E-03-01

262726-14

WIRING DEVICES



9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact. E. Receptacle Orientation:
  1. Install ground pin of vertically mounted receptacles down and on horizontally mounted receptacles to the right.
  2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- 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, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

### 3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

### 3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle 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 in accordance with manufacturer's recommendations:
  1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.

2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated 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.

END OF SECTION

## SECTION 26 28 13

### FUSES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings 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. Cartridge fuses rated 600-V ac and less for use in enclosed switches and enclosed controllers.
2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches.
3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
4. 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.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

#### 1.4 CLOSEOUT SUBMITTALS

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

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse
4. Coordination charts and tables and related data.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

#### 1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

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. Comply with UL 248-11 for plug fuses.

#### 1.7 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C) apply manufacturer's ambient temperature adjustment factors to fuse ratings.

#### 1.8 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Bussmann, Inc.
  2. Edison Fuse, Inc.
  3. Ferraz Shawmut, Inc.
  4. Littelfuse, Inc.

### 2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

### 2.3 PLUG FUSES

- A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

### 2.4 PLUG-FUSE ADAPTERS

- A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

### 2.5 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and keycoded 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- (38-mm-) high letters on exterior of door.
  4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

## **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 FUSE APPLICATIONS**

- A. Cartridge Fuses:
  - 1. Motor Branch Circuits: Class RK1, time delay.
  - 2. Other Branch Circuits: Class RK1, time delay.
  - 3. Control Circuits: Class CC, fast acting.
- B. Plug Fuses:
  - 1. Motor Branch Circuits: Edison-base type, dual-element time delay.
  - 2. Other Branch Circuits: Edison-base type, single-element fast acting.

### **3.3 INSTALLATION**

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.
- C. Install spare-fuse cabinet(s).

### **3.4 IDENTIFICATION**

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

**END OF SECTION**

PROJ. NO. 16228E-03-  
01 262813-5 FUSES

## SECTION 26 28 16

### ENCLOSED SWITCHES AND CIRCUIT BREAKERS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Receptacle switches.
  - 4. Shunt trip switches.
  - 5. Molded-case circuit breakers (MCCBs).
  - 6. Molded-case switches.
  - 7. Enclosures.

##### 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

PROJ. NO. 16228E-03-01  
262816-1

ENCLOSED SWITCHES AND CIRCUIT BREAKERS



1.
  - 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.
    - 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.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
  1. Wiring Diagrams: For power, signal, and control wiring.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.
  1. Test procedures used.
  2. Test results that comply with requirements.
  3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Manufacturer's field service report.

#### 1.7 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 01 7823 "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.

#### 1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

#### 1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

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

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. 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.

#### 1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

- 1.
  1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
  2. Altitude: Not exceeding 6600 feet (2010 m).
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

- 1.
2. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electric service.  
Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.

#### 1.11 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.

### **PART 2 - PRODUCTS**

#### 2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- C. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge or plug fuse interiors to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Six Pole, Single Throw, 240-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Type HD, Heavy Duty, Double Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

- 1.
  - 2.
- G. Accessories:
- Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  5. Auxiliary Contact Kit: One or Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
  6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  7. Lugs: Mechanical type, suitable for number, size, and conductor material.
  8. Service-Rated Switches: Labeled for use as service equipment.
  9. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac, 120-V ac or 208-V ac.

## 2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- C. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Six Pole, Single Throw, 240-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

- 1.
- 2.
- F. Type HD, Heavy Duty, Double Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position. G. Accessories:
  - Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  4. Auxiliary Contact Kit: One or Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
  5. Hookstick Handle: Allows use of a hookstick to operate the handle.
  6. Lugs: Mechanical type, suitable for number, size, and conductor material.
  7. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac, 120-V ac or 208-V ac.

### 2.3 RECEPTACLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- C. Type HD, Heavy-Duty, Single-Throw Fusible Switch: 240-V ac, 30A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate specified indicated fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Type HD, Heavy-Duty, Single-Throw Nonfusible Switch: 240-V ac, 30A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- E. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.

- 1.
  - 2.
- 2.4 SHUNT TRIP SWITCHES
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Cooper Bussmann, Inc.
  2. Ferraz Shawmut, Inc.
  3. Littelfuse, Inc.
- C. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.
- D. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- E. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, connected pilot, and indicating and control devices. F. Accessories:
1. Oiltight key switch for key-to-test function.
  2. Oiltight red ON pilot light.
  3. Isolated neutral lug; 100 percent rating.
  4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
  5. Form C alarm contacts that change state when switch is tripped.
  6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac coil voltage.
  7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

## 2.5 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- C. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- D. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.



- E. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- F. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
  - 1. Instantaneous trip.
  - 2. Long- and short-time pickup levels.
  - 3. Long- and short-time time adjustments.
  - 4. Ground-fault pickup level, time delay, and  $I^2t$  response.
- G. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- H. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- I. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- J. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- K. Features and Accessories:
  - 1. Standard frame sizes, trip ratings, and number of poles.
  - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
  - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
  - 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 5. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system, specified in Section 260913 "Electrical Power Monitoring and Control."
  - 6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
  - 8. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
  - 9. Alarm Switch: One NO] contact that operates only when circuit breaker has tripped.
  - 10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
  - 11. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking groundfault protection function.

12. Electrical Operator: Provide remote control for on, off, and reset operations.
13. Accessory Control Power Voltage: Integrally mounted, self-powered; 24-V ac or 120-V .

## 2.6 MOLDED-CASE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric.
- C. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating. D. Features and Accessories:
  1. Standard frame sizes and number of poles.
  2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
  3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
  6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
  7. Alarm Switch: One NO contact that operates only when switch has tripped.
  8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
  9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
  10. Electrical Operator: Provide remote control for on, off, and reset operations.
  11. Accessory Control Power Voltage: Integrally mounted, self-powered; 24-V ac or 120V ac.

## 2.7 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  2. Outdoor Locations: NEMA 250, Type 3R

PROJ. NO. 16228E-03-01  
262816-11

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work. B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 26 0548 "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components. D. Install fuses in fusible devices.
- E. Comply with NECA 1.

#### **3.3 IDENTIFICATION**

- A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."
  1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.

#### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit. E. Tests and Inspections:
    - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
    - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
    - 3. Perform the following infrared scan tests and inspections and prepare reports:
      - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
      - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
      - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    - 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

**END OF SECTION**

## SECTION 26 43 13

### TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings 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 field-mounted SPD for low-voltage (120 to 600 V) power distribution and control equipment.
- B. Related Sections:

1. Section 26 24 13 "Switchboards" for factory-installed SPD.
2. Section 26 24 16 "Panelboards" for factory-installed SPD.
3. Section 26 27 26 "Wiring Devices" for devices with integral SPD.

##### 1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. SVR: Suppressed voltage rating.
- C. SPD: Transient voltage surge suppressor(s), both singular and plural; also, transient voltage surge suppression.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating weights, electrical characteristics, furnished specialties, and accessories.

##### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Certificates: For SPD devices, from manufacturer.
- C. Field quality-control reports.
- D. Warranties: Sample of special warranties.

PROJ. NO. 16228E-03-01  
264313-1

TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For SPD devices to include in emergency, operation, and maintenance manuals.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

## 1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.
- C. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.
- D. Comply with NEMA LS 1.
- E. Comply with UL 1283 and ANSI/UL 1449 3<sup>RD</sup> Edition.
- F. Comply with NFPA 70.

## 1.9 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
  - 1. Notify Construction Manager and Owner no fewer than two weeks in advance of proposed electrical service interruptions.
  - 2. Do not proceed with interruption of electrical service without Construction Manager's and Owner's written permission.
- B. Service Conditions: Rate SPD devices for continuous operation under the following conditions unless otherwise indicated:
  - 1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
  - 2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
  - 3. Humidity: 0 to 85 percent, noncondensing.

4. Altitude: Less than 20,000 feet (6090 m) above sea level.

#### 1.10 COORDINATION

- A. Coordinate location of field-mounted SPD devices to allow adequate clearances for maintenance.
- B. Coordinate SPD devices with Section 26 0913 "Electrical Power Monitoring and Control."

#### 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Ten years from date of Substantial Completion.
- B. Special Warranty for Cord-Connected, Plug-in Surge Suppressors: Manufacturer's standard form in which manufacturer agrees to repair or replace electronic equipment connected to circuits protected by surge suppressors.

### **PART 2 - PRODUCTS**

#### 2.1 SERVICE ENTRANCE SUPPRESSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Surge Suppression Inc. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. AC Data Solutions..
  - 2. Atlantic Scientific.
  - 3. Current Technology Inc.; Danaher Power Solutions.
  - 4. Danaher Power Solutions; United Power Products..
  - 5. Intermatic, Inc.
  - 6. LEA International.
  - 7. Leviton Mfg. Company Inc.
  - 8. Liebert Corporation; a division of Emerson Network Power.
  - 9. Northern Technologies, Inc.; a division of Emerson Network Power.
  - 10. Surge Suppression Incorporated. C. Surge Protection Devices:
    - 1. Non-modular.
    - 2. LED indicator lights for power and protection status.
    - 3. Audible alarm, with silencing switch, to indicate when protection has failed.



4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
  5. Type 1 SPD Nominal Discharge Current Rating: 20kA
- D. Peak Single-Impulse Surge Current Rating: 100 kA per mode/300 kA per phase.
- E. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2
1. Line to Neutral: 70,000A.
  2. Line to Ground: 70,000A.
  3. Neutral to Ground: 50,000A.
- F. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 V, 3-phase, 4wire circuits shall be as follows:
1. Line to Neutral: 800 V for 480Y/277 V.
  2. Line to Ground: 800 V for 480Y/277 V.
  3. Neutral to Ground: 800 V for 480Y/277 V.
- G. Protection modes and UL 1449 SVR for 240/120 V, single-phase, 3-wire circuits shall be as follows:
1. Line to Neutral: 400 V.
  2. Line to Ground: 400 V.
  3. Neutral to Ground: 400 V.
- H. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:
1. Line to Neutral: 400 V, 800 V from high leg.
  2. Line to Ground: 400 V.
  3. Neutral to Ground: 400 V.
- I. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:
1. Line to Line: 2000 V for 480 V.
  2. Line to Ground: 2000 V for 480 V.

## 2.2 PANELBOARD SUPPRESSORS

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

PROJ. NO. 16228E-03-01  
264313-4

TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

B. Basis-of-Design Product: Surge Suppression Inc. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. AC Data Solutions..
2. Atlantic Scientific.
3. Current Technology Inc.; Danaher Power Solutions.
4. Danaher Power Solutions; United Power Products..
5. Intermatic, Inc.
6. LEA International.
7. Leviton Mfg. Company Inc.
8. Liebert Corporation; a division of Emerson Network Power.
9. Northern Technologies, Inc.; a division of Emerson Network Power.
10. Surge Suppression Incorporated.

C. Surge Protection Devices:

1. Non-modular.
2. LED indicator lights for power and protection status.
3. Audible alarm, with silencing switch, to indicate when protection has failed.
4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

D. Surge Protection Devices:

1. Comply with UL 1449.
2. Modular design (with field-replaceable modules).
3. Short-circuit current rating complying with UL 1449, and matching or exceeding the panelboard short-circuit rating and redundant suppression circuits; with individually fused metal-oxide varistors.
4. Fuses, rated at 200-kA interrupting capacity.
5. Fabrication using bolted compression lugs for internal wiring.
6. Integral disconnect switch.
7. Redundant suppression circuits.
8. Redundant replaceable modules.
9. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
10. LED indicator lights for power and protection status.
11. Audible alarm, with silencing switch, to indicate when protection has failed.
12. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
13. Four digit transient-event counter set to totalize transient surges. E. Peak Single-

Impulse Surge Current Rating:

PROJ. NO. 16228E-03-01  
264313-5

TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

1. Distribution Panels 250 Amps or higher: 160kA per mode / 180 kA per phase.
  2. Branch Panels up to 225 Amps: 40 kA per mode / 120 kA per phase.
- F. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2:
1. Line to Neutral: 70,000A.
  2. Line to Ground: 70,000A.
  3. Neutral to Ground: 50,000A.
- G. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120 V, 3-phase, 4wire circuits shall be as follows:
1. Line to Neutral: 400 V for 208Y/120 V.
  2. Line to Ground: 400 V for 208Y/120 V.
  3. Neutral to Ground: 400 V for 208Y/120 V.
- H. Protection modes and UL 1449 SVR for 240/120-V, single-phase, 3-wire circuits shall be as follows:
1. Line to Neutral: 400 V.
  2. Line to Ground: 400 V.
  3. Neutral to Ground: 400 V.
- I. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:
1. Line to Neutral: 400 V, 800 V from high leg.
  2. Line to Ground: 400 V.
  3. Neutral to Ground: 400 V.
- J. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:
1. Line to Line: 1000 V for 240 V.
  2. Line to Ground: 800 V for 240 V.

## 2.3 ENCLOSURES

- A. Indoor Enclosures: NEMA 250 Type 1.
- B. Outdoor Enclosures: NEMA 250 Type 4.

## PART 3 - EXECUTION

PROJ. NO. 16228E-03-01  
264313-6

TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

### 3.1 INSTALLATION

- A. Install TVSS devices at service entrance on load side, with ground lead bonded to service entrance ground.
- B. Install TVSS devices for panelboards and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
  - 1. Provide multiple, **30-A** circuit breaker as a dedicated disconnecting means for TVSS unless otherwise indicated. Bus-Mounted SPD's shall not be permitted.

### 3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
  - 1. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. D. Tests and Inspections:
    - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
    - 2. After installing TVSS devices but before electrical circuitry has been energized, test for compliance with requirements.
    - 3. Complete startup checks according to manufacturer's written instructions.
- E. TVSS device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

### 3.3 STARTUP SERVICE

- A. Do not energize or connect service entrance equipment to their sources until TVSS devices are installed and connected.

- B. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

#### 3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to maintain TVSS devices.

**END OF SECTION**

SECTION 028200

REMOVAL OF ASBESTOS-CONTAINING MATERIALS

PART 1 GENERAL

1.1 STIPULATIONS

- A. The procedures specified in this section are guidelines for minimum performance. The Contractor is responsible for their own methods of operation and conformance to regulatory codes, rules and guidelines. The Contractor is required to obtain all permits, licenses and approvals to perform the work, including any rights to use patented systems.

1.2 SCOPE OF WORK

- A. Furnish all materials, labor, equipment and supervision necessary to perform the work as indicated on the documents for the removal, residual encapsulation, and disposal of asbestos containing material (ACM). The work shall be performed in accordance with the current EPA and OSHA Regulations, State Labor and Industry and Department of Environmental Protection Regulations, The City of Philadelphia, and any other applicable Federal, State and Local Regulations.
- B. Contractor shall submit an Action Plan which describes specifically how abatement work is to be completed for each abatement phase. At a minimum the work Plan shall address work area preparation, work practices, decontamination location, estimated completion dates, respiratory protection, and disposal. Approval of the Action Plan must be obtained through the Professional prior to the start of work. Procedures outlined in the Action Plan must be followed throughout the abatement phase. Any changes in Action Plan must obtain prior approval from Professional.
- C. Without intending to limit and/or restrict the volume of work required by this specification, the work generally consists of removal, decontamination and disposal of designated ACM Roofing component.
- D. Removal and disposal of:

Disston Recreational Center		
Location	Material Description	Quantity
Main Lobby	Pipe Insulation	8 linear feet (LF)

1.3 SUBMITTALS

- A. Contractor Submittal Register: Minimum pre-mobilization Contractor submittals should include but is not limited to the following:

1. Asbestos Demolition/Renovation Notification to Appropriate Regulatory Agencies (EPA, PA DEP, PA L&I, City of Philadelphia Air Management Services).
  2. Physician's Written Medical Opinion Form for each worker.
  3. Fit Test Certification for each worker.
  4. Analytical Laboratory Accreditation Name of Laboratory used for Personal Air Sample Analysis (AIHA Preferred NIOSH PAT accredited minimum) and Air Monitoring.
  5. Name and License Number of Waste Hauler
  6. Name, Address, License Number (or copy of Certification), Telephone Number, and Contact Person of Landfill.
- B. The Contractor shall submit an air monitoring schedule for approval prior to work.
- C. Final payment to the Contractor will not be processed until the final report from the QA Firm has been received and approved.

#### 1.4 REGULATORY SUBMITTALS (CONTRACTOR RESPONSIBILITY)

- A. The Contractor is required to notify the following agencies in writing ten (10) days prior to starting work for notification and instructions concerning proper disposal of asbestos waste material.
1. United States Environmental Protection Agency – Region III  
Asbestos-NESHAP Coordinator (3AT33)  
1650 Arch Street  
Philadelphia, Pennsylvania 19103
  2. Asbestos Notification  
P.O. Box 8468  
400 Market Street  
Harrisburg, Pennsylvania 17105-8468
  3. Pennsylvania Department of Labor and Industry  
Asbestos Occupation Accreditations & Certification  
Bureau of Occupational and Industrial Safety  
Room 1623 – Labor and Industry Building  
Seventh and Foster Streets  
Harrisburg, Pennsylvania 17120
  4. City of Philadelphia Air Management Services (AMS)  
321 S University Avenue  
Philadelphia, Pennsylvania 19104

#### 1.5 MONITORING AND AIR TESTING

- A. Quality assurance and air testing services will be hired by the Professional for its use only.

- B. OSHA personnel air monitoring shall be provided by Contractor to collect STEL and breathing zone samples as required.
- C. Quality Assurance Firm contracted by Department shall collect building air samples, enforce specification, complete visual inspections, and perform all other related tasks in accordance with the City of Philadelphia Asbestos Control Regulation (ACR).

## 1.6 CERTIFICATION

### A. Worker Certification

1. The Contractor shall furnish proof that his employees have had instruction on the dangers of asbestos exposure, on respirator use, decontamination and current OSHA and EPA regulations.
2. Documentation of workers medical exams, consist of x-rays and pulmonary function shall be submitted and as may be required by current OSHA and EPA regulations and any applicable State and Local Government regulations.
3. There must be on site at all times, an EPA Certified Asbestos Abatement Supervisor. The Asbestos Abatement Supervisor shall have successfully completed a 5-day EPA Certified Practices and Procedures Course as per 40 CFR, Part 763, Subpart E, Appendix C-EPA Model Accreditation Plan (must provide a copy of certificate from EPA approved course). All asbestos workers shall have successfully completed a 4-day EPA Certified Practices and Procedures Course as per 40 CFR, Part 763, Subpart E, Appendix C-EPA Model Accreditation Plan. The Contractor must provide copies of certificates from Pennsylvania Department of Labor and Industry for all workers, and supervisors as required by regulation.
4. When required by the Pennsylvania Department of Labor and Industry (PDL&I) the Contractor, Abatement Supervisor, and Abatement Workers shall be licensed by (PDL&I) and the City of Philadelphia. Each worker/supervisor shall have a current photo identification issued by PDL&I available on request by the Department and the City of Philadelphia Inspectors when required.

## 1.7 REGULATORY REQUIREMENTS

### A. Commonwealth of Pennsylvania State and Local Codes and Regulations:

1. DEP: Pa Code Title 25  
Allegheny County Health Department (ACHD)  
Article XX; City of Philadelphia Asbestos Control Regulations
2. Department of Labor & Industry:  
Act 194 of 1990: Certificate for Asbestos Abatement Work

### B. Federal Codes and Regulations and Guidelines:

1. EPA: Environmental Protection Agency Regulations
2. 'Guidelines for Controlling Asbestos Containing Materials in Building', EPA, Federal Register, 40 CFR 61, Subpart M, latest edition



3. AHERA: Asbestos Hazard Emergency Response Act; 40 CFR 763, Part E, Bulk Sampling and Clearances
  4. OSHA: Occupational Safety and Health Administration Standards, with specific reference to 29 CFR; 1910.1001; 1910.134; 1910.1200; 29 CFR 1926.1108
  5. DOT: Transportation of Asbestos Containing Materials
- C. Independent Regulatory Agencies:
1. NVLAP: National Voluntary Laboratory Accreditation Program
  2. NIOSH PAT Program: National Institute for Occupational Safety and Health Proficiency Analytical Testing Program for Testing Laboratories
  3. AIHA: American Industrial Hygiene Association
  4. MSHA: The Mine Safety and Health Administration
- D. Reference Standard ASTM E 1468-90 Standard Practice for Visual Inspection of Asbestos Abatement Projects.

## PART 2                    PRODUCTS

2.1 The list of required materials will include, but is not necessarily limited to the following:

- A. Respirators: Provide respiratory protection in accordance with OSHA Regulations 29 1926.11011, appendices ANSI Z 88.2-1980 and 29 CFR 1910.134. Respiratory protection shall be as listed below:
1. Respiratory protection shall be used when there is a disturbance of friable asbestos containing materials.
  2. Require that a respirator be worn by anyone in a work area at all times, regardless of activity, during a period that starts with any operation which could cause airborne fibers, until all visible ACM has been removed and the work area cleared.
  3. The minimum level of respiratory protection that can be used is a half-face air purifying respirators with high efficiency filters. The use of single use, disposable or quarter-face respirators for any purpose is prohibited.
  4. Employees or visitors shall wear this type of respirator. Respirators shall be NIOSH/MSHA approved.
- B. Protective Clothing
1. Disposable Clothing: Manufactured by "Tyvek" by DuPont, or approved equal. Clothing shall consist of coverall, head cover, and foot cover. Gloves will be worn for hand cover as required.

- C. Wetting Agents: Wetting agents are used prior to disturbance of asbestos containing materials.
  - 1. Amended Water: Amended water consists of 1/2 ounce of surfactant mixed in a gallon of water. A surfactant is a mixture of 50% polyoxyethylene ester and 50% polyoxyethylene ether, or equal.
  - 2. Removal Encapsulant: A removal encapsulant is a penetrating type encapsulant that is used in areas requiring a longer removal time span or is subject to rapid evaporation of amended water. Removal encapsulants wet the asbestos containing material and retard fiber release during disturbance of the material equal to or greater than that provided by amended water.
- D. Polyethylene Sheeting: Six (6) mil, for vertical protection (walls, doors, windows) and for all other uses (floors, fixed equipment, HVAC supply and return openings).
- E. Polyethylene Bags with Caution Labels: Six (6) mil minimum for disposal. All asbestos that is removed shall be double bagged.
- F. Tape: High quality vinyl or fabric duct tape. Paper masking tape will not be permitted.
- G. Airless Spray Equipment: Electric airless spray equipment for saturating and mist fiber control. Low pressure (500 psi) equipment must be available on-site and utilized as required.
- H. Vacuum: HEPA rated for surface cleaning and housekeeping. Hand operated and power tools such as, but not limited to, saws, scorers, abrasive wheels, and drills should be provided with local exhaust ventilation systems with HEPA filters.
- I. Hand Tools: Brooms, plastic shovels, scrapers, brushes, etc., in sufficient quantity to ensure the appropriate level of housekeeping.
- J. GFI Equipment: All electrical connections in the work area must be through "ground fault" protected outlets/circuits.

## 2.2 PERSONNEL PROTECTION

- A. Personnel protection is required for laborers, mechanics, supervision, and visitors at the work site during the set-up and abatement operations.
- B. Each worker shall be supplied with a minimum of two (2) complete protective work clothes and respirator filter changes per day for the complete duration of the project. Hard hats should be available as appropriate which meet ANSI Z-89.1 standards. Safety toe footwear is to be worn underneath the disposable shoe covers and must meet the requirements and specifications in ANSI Z-41.1. Eye wear and face protection must meet the standards and specifications of ANSI Z-87.1.1.
- C. In addition to protective work clothes for workers, the Contractor shall have on hand two (2) additional sets of work clothes, per day and respirators for personnel who are authorized to inspect the work site. Hard hats should be available as appropriate which meet ANSI Z-89.1 standards. Safety toe footwear is to be worn underneath the disposable shoe covers and must meet the requirements and specifications in

ANSI Z-41.1. Eye wear and face protection must meet the standards and specifications of ANSI Z-87.1.

- D. Respirators approved for asbestos use and protective work clothes will be worn by laborers and mechanics as a minimum during set-up and pre-cleaning operations.
- E. Appropriate respirators will be worn by all personnel in the active work area.
- F. Upon leaving the active work area, filters will be discarded, cartridges removed, and respirators cleaned in disinfectant solution and clean water rinse.
- G. Clean respirators will be stored in plastic bags when not in use.
- H. Respirators will be inspected daily for broken, missing or deteriorated parts.

### PART 3        EXECUTION

#### 3.1 PREPARATION AND REMOVAL

- A. Install isolation barriers to separate work areas from building occupants whenever work is occurring in hallways or other areas that are not enclosed in walls with lockable entrances unless all building occupants can be removed from the entire floor while the abatement work is occurring. The isolation barriers shall be constructed with wood or equivalent framing and plywood (minimum 3/8" thickness). A lockable door may need to be installed at the barrier for access to the work area(s).
- B. Install a worker decontamination shower facility, equipped with a shower room and clean room at a remote location on the floor in the building central to the abatement work occurring on each floor. The shower facility shall consist of a clean room and shower room separated from each other by airlocks with a minimum of two (2) layers of 6-mil polyethylene sheeting or equivalent in each room. A separate chamber for the bag out of asbestos waste may be attached to the side of the dirty / equipment room or placed at another entrance to the work area.
- C. Pre-clean each work area prior to prepping enclosures using a HEPA-filtered vacuum and wet wiping methods where feasible. Movable objects in the work area(s) shall be pre-cleaned and removed from the work area(s). All fixed objects within the work area(s) shall be sealed with one (1) layer of 6-mil polyethylene.
- D. Erect the removal enclosure around the pipe insulation and/or fittings to be abated sealing all surfaces in one (1) layer of 6 mil polyethylene sheeting on the floor, walls, and ceiling forming an airtight seal with an airlock (*3 layers of 6 mil polyethylene overlapping each other sealed at the top and on alternating sides*) opening for entry and to allow make up air to enter the enclosure. Install a single stage decontamination chamber where the workers can remove their outer layer coveralls before proceeding to the next work area or the remote decon located on that floor.
- E. The enclosure will have at least one HEPA vacuum or junior HEPA machine (as appropriate for the size of the enclosure) connected the enclosure to establish a negative pressure differential (NPD) within the enclosure. Exhaust from the HEPA machine shall be vented outside the building. The NPD must be demonstrated through smoke testing and sufficient to provide at least two (2) air changes in the

enclosure per hour. Exhaust from the HEPA AFD shall be vented outside the building.

- F. The contractor shall follow proper removal procedures at all times in accordance with the City of Philadelphia, Air Management Services, Asbestos Control Regulation (ACR), the US EPA Regulations and Standards including the National Emissions Standards for Hazardous Air Pollutants (NESHAPS), and OSHA Asbestos in Construction Regulations, 1926.1101. All asbestos containing materials shall be continually wetted with amended water during removal procedures. Dry removal of asbestos will not be permitted. All Regulated Asbestos Containing Materials (RACM) shall be regularly cleaned up and stored in industry standard waste bags, drums, or wrapped in two (2) layers of 6 mil polyethylene or equivalent with NESHAP and waste generator labels affixed to them. Asbestos waste material must be adequately wet and the bags shall be goose necked, sealed with duct tape, and wiped clean prior to being removed from the work area. RACM waste will be bagged out of the work area and stored in a lockable waste container.
- G. Remove all the accessible pipe and fitting insulation in each work area using proper containment-bag (glove bag) techniques. A minimum of two workers are required for each containment-bag. Each containment bag shall be equipped with a pump sprayer filled with amended water, tools for the removal of pipe insulation, and a HEPA vacuum attached to the bag. Each containment bag is only to be used once and not to be repositioned elsewhere. Containment bags will be smoke tested for air tightness by the Contractor and overseen by the API. 6-mil polyethylene sheeting shall be installed on the floor beneath the pipe or pipe fitting insulation being removed, extending a minimum of five (5) feet in all directions or the full extent of the floor space in the enclosure.
- H. After removal and final cleaning of all accessible pipe and pipe fitting insulation in each work area, seal up all openings in the floor, walls, and ceilings where the pipe enters with heat resistant and fire retardant foam to a depth of at least 1 inch into the cavity. (All insulation should be removed to a depth of at least 1 inch into the penetration whenever feasible.)
- I. After complete removal and final cleaning of all asbestos containing materials throughout each work area, the API and the Contractor's supervisor will inspect each work area. Once the work area passes a visual inspection and contains no visible asbestos debris, then encapsulation of the work area shall occur prior to running final air tests.
- J. Final air tests will be performed by the API in accordance with the ACR. Aggressive air sampling protocol will be used during final clearance testing.

### 3.2 MONITORING AND AIR TESTING

#### A. Monitoring and Air Testing Firm

- 1. The Department shall contract with a Quality Assurance (QA) Firm affiliated with a fully accredited testing laboratory which specializes in performing air sampling, monitoring and inspections.
- 2. The QA Firm will be responsible for certifying the project was completed in accordance with all EPA/DEP, OSHA, and City of Philadelphia standards and

PROJECT No. 16228E-03-01

02820 -7

REMOVAL OF ASBESTOS-CONTAINING MATERIALS

regulations and ensure work practices used do not create asbestos contamination to adjacent area(s).

3. Air sampling of the work areas and surrounding environment will be conducted during the performance of this contract by the Monitoring Firm to ensure compliance with all codes, regulations, ordinances and this specification. Surrounding environments or interior areas shall be deemed contaminated if air tests are greater than .01 f/cc or background levels.
  4. The Contractor shall fully cooperate with the QA Firm and all others responsible for testing and inspecting the work. An air testing and monitoring schedule shall be submitted prior to the start of work.
  5. Air testing and analyses shall be in accordance with Federal, State and Local Codes.
- B. Interior air sampling may be performed in and around occupied building spaces immediately adjacent to the work area.
- C. The QA Firm shall provide certification that the work area meets the following clearances:
1. Visual inspection indicates no ACM remains.
  2. Completion of certificate of visual inspection form.
- D. The Contractor shall inform the Department immediately of any elevated OSHA personnel air test data.
- E. Contractor shall be responsible for OSHA personal air sampling daily on a worker(s) in the most potential area of exposure.

### 3.3 SITE CLEAN UP

- A. All bagging and handling activities of ACM or contaminated wastes shall be accomplished wearing full protective clothing and respirators.
- B. Carefully load containerized waste on sealed trucks, dumpster or other acceptable vehicle for transport. Care must be taken before and during transport to ensure that no unauthorized persons have access to the material.
- C. Bagged material ready for disposal shall not be stored outside of the work area. Bags are to be taken from the work area directly to a sealed truck or dumpster.
- D. Bagged materials shall not be transported in open trucks. Drums, if used, shall be marked with same warning labels as bags. Uncontaminated drums may be reused. Drums that have been contaminated shall be treated as asbestos containing waste and disposed of in accordance with this specification.
- E. The sanitary landfill operator shall be advised of the quantity of material to be delivered, at least forty-eight (48) hours in advance of transport.

### 3.4 TRANSPORTATION AND DISPOSAL

- A. All friable asbestos (RACM) containing material shall be double bagged with OSHA and NESHAP required labeling on each bag. Waste shall be transported in enclosed or covered truck to a landfill approved for asbestos by the Pennsylvania Department of Environmental Protection. A waste shipment record shall be provided in accordance with NESHAP regulations at project end.
  - 1. Friable material (dust, debris, etc.) generated from a cutting machine or rotating blade shall be included in this.
- B. Waste disposal provisions of the latest NESHAP revision will apply.

END OF SECTION