

# Project Manual

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## Volume 2



Prepared for:

**West Whiteland Township**

101 Commerce Drive  
Exton PA, 19341

Project:

**New Construction of:  
Public Works Facility**

121 Valley Creek Boulevard  
Exton, PA 19431

Prepared by:

**SCHRADERGROUP**

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Philadelphia, Pennsylvania 19127

Bid Documents:            05 July 2023



## TABLE OF CONTENTS

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### **VOLUME 1 – DIVISIONS 0 – 1**

#### **DRAWING INDEX**

As Listed On Contract Drawings Cover Sheet

#### **DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS**

Section 000002 -	SG Copyright
Section 000003 -	List of Drawings
Section 001113 -	Bid Advertisement
Section 002000 -	Instructions to Bidders
Section 002100 -	Supplementary Instructions to Bidders
Section 004116 -	Bid Form Contract 1 – General Construction
Section 004117 -	Bid Form Contract 2 – Civil Construction
Section 004118 -	Bid Form Contract 3 – Plumbing Construction
Section 004119 -	Bid Form Contract 4 – Mechanical Construction
Section 004120 -	Bid Form Contract 5 – Electrical Construction
Section 004121 -	Bid Form Contract 6 – FP Construction
Section 004200 -	Bid Attachments
Section 004210 -	Waiver of Liens
Section 005200 -	Agreement Between Owner and Contractor
Section 006100 -	Cast-In-Place Concrete Slabs
Section 007000 -	Cast-In-Place Concrete Slabs
Section 008200 -	Cast-In-Place Concrete Slabs
Section 009000 -	Construction Forms

#### **DIVISION 01 – GENERAL REQUIREMENTS**

Section 011100 -	Summary of Work
Section 011200 -	Multiple Contract Summary
Section 012300 -	Alternates
Section 012500 -	Contract Modification Procedures
Section 012900 -	Payment Procedures
Section 013110 -	Project Meetings
Section 013200 -	Construction Progress Documentation
Section 013300 -	Submittal Procedures
Section 013500 -	Safety
Section 014100 -	Regulatory Requirements
Section 014200 -	References
Section 014500 -	Quality Control
Section 015100 -	Temporary Utilities and Facilities

Section 015300 -	Temporary Barriers and Enclosures
Section 015800 -	Project Identification Signs
Section 016100 -	Basic Product Requirements
Section 016300 -	Product Substitution Procedures
Section 017400 -	Cleaning
Section 017700 -	Closeout Procedures
Section 017800 -	Project Record Documents
Section 017810 -	Warranties and Bonds

## **VOLUME 1 – APPENDIX**

Geotechnical Report
Township's Responsible Contractors Ordinance (RCO)

## **VOLUME 2 – DIVISIONS 2 – 14**

### **DIVISION 2 – SITEWORK**

Reference Civil Drawings for Specification requirements
---

### **DIVISION 3 – CONCRETE**

Section 031000 -	Concrete Forming and Accessories
Section 032000 -	Concrete Reinforcing
Section 033000 -	Cast-In-Place Concrete
Section 033050 -	Cast-In-Place Concrete Slabs

### **DIVISION 4 – MASONRY**

Section 042200 -	Unit Masonry
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### **DIVISION 5 - METALS**

Section 051200 -	Structural Steel
Section 055000 -	Metal Fabrications
Section 055213 -	Pipe and Tube Railings

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

Section 061000 -	Rough Carpentry
Section 061053 -	Miscellaneous Rough Carpentry
Section 061760 -	Metal-Plate Connected Wood Trusses
Section 066000 -	PVC Wall Panels
Section 066510 -	Solid Surface Fabrications

### **DIVISION 7 - THERMAL AND MOISTURE PROTECTION**

Section 071113 -	Bituminous Dampproofing
Section 072100 -	Thermal Insulation
Section 072500 -	Moisture Barriers
Section 075433 -	Thermoplastic Polyolefin (TPO) Roofing
Section 076200 -	Sheet Metal Flashing and Trim
Section 077100 -	Roof Specialties
Section 079200 -	Joint Sealants

## **DIVISION 8 - OPENINGS**

Section 081113 -	Hollow Metal Doors and Frames
Section 081613 -	FRP Flush Doors
Section 083113 -	Access Doors and Frames
Section 083310 -	Overhead Coiling Doors
Section 083613 -	Sectional Overhead Doors
Section 084113 -	Aluminum-Framed Storefronts
Section 084523 -	Translucent Fiberglass Panel Unit Wall System
Section 085200 -	Aluminum Windows
Section 087100 -	Door Hardware
Section 088000 -	Glazing

## **DIVISION 9 - FINISHES**

Section 092900 -	Gypsum Board
Section 095113 -	Acoustical Panel Ceilings
Section 096513 -	Resilient Base and Accessories
Section 096813 -	Tile Carpeting
Section 099113 -	Exterior Painting
Section 099123 -	Interior Painting

## **DIVISION 10 - SPECIALTIES**

Section 101100 -	Visual Display Units
Section 101400 -	Interior Signage
Section 101419 -	Dimensional Letter Signage
Section 102800 -	Toilet and Bath Accessories
Section 104413 -	Fire Protection Cabinets
Section 104416 -	Fire Extinguishers
Section 105000 -	Metal Lockers

## **DIVISION 11 – EQUIPMENT**

N/A

## **DIVISION 12 - FURNISHINGS**

Section 123216 -	Manufactured Plastic-Laminate-Faced Casework
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## **DIVISION 13 - SPECIAL CONSTRUCTION**

Section 133419 - Metal Building Systems

## **DIVISION 14 - CONVEYING EQUIPMENT**

N/A

## **VOLUME 3 – DIVISIONS 21 – 34**

## **DIVISION 20 – MECHANICAL SUPPORT**

N/A

## **DIVISION 21 – FIRE SUPPRESSION**

Section 210100 - General Provisions  
Section 210500 - Common Work Results for Fire Suppression  
Section 210553 - Identification for Fire Suppression Piping & Equipment  
Section 211300 - Fire-Suppression Sprinkler Systems

## **DIVISION 22 - PLUMBING**

Section 220100 - General Provisions  
Section 220502 - Excavation, Backfill & Compaction for Utility Trenches  
Section 220516 - Expansion Fittings and Loops for Plumbing Piping  
Section 220519 - Meters and Gages for Plumbing Piping  
Section 220548 - Vibration Isolation & Seismic Mountings  
Section 220553 - Identification for Plumbing Piping and Equipment  
Section 220719 - Plumbing Piping Insulation  
Section 221005 - Plumbing Piping  
Section 221006 - Plumbing Piping Specialties  
Section 221500 - Compressed Air Systems  
Section 223000 - Plumbing Equipment  
Section 223300 - Electric Water Heaters  
Section 224000 - Plumbing Fixtures

## **DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC)**

Section 230501 - HVAC General Requirements  
Section 230513 - Common Motor Requirements for HVAC Equipment  
Section 230549 - Vibration Isolation  
Section 230554 - Mechanical Identification  
Section 230593 - Testing, Adjusting and Balancing for HVAC  
Section 230714 - HVAC Duct Insulation  
Section 230719 - HVAC Piping Insulation

Section 230993 -	HVAC Control Sequence
Section 232113 -	Hydronic Piping
Section 232117 -	Pipe Hangers, Supports and Anchors
Section 232300 -	Refrigerant Piping
Section 233100 -	HVAC Ducts and Casings
Section 233300 -	Air Duct Accessories
Section 233416 -	HVAC Fans
Section 233700 -	Air Outlets and Inlets
Section 233750 -	Wall Louvers
Section 238101 -	Terminal Heat Transfer Units
Section 238129 -	Variable Refrigerant Flow HVAC Systems

## **DIVISION 25 – INTEGRATED AUTOMATION**

N/A

## **DIVISION 26 - ELECTRICAL**

Section 260100 -	General Requirements
Section 260513 -	Medium Voltage Cable
Section 260519 -	Low Voltage Electrical Power Conductors and Cable
Section 260526 -	Grounding and Bonding for Electrical Systems
Section 260529 -	Hangers and Supports for Electrical Systems
Section 260534 -	Conduit
Section 260537 -	Boxes
Section 260553 -	Identification for Electrical Systems
Section 260573 -	Power System Studies
Section 260914 -	Electrical Power Monitoring
Section 260923 -	Lighting Control Devices
Section 262100 -	Low Voltage Electrical Service Entrance
Section 262200 -	Low Voltage Transformers
Section 262413 -	Switchboards
Section 262416 -	Panelboards
Section 262717 -	Equipment Wiring
Section 262726 -	Wiring Devices
Section 262813 -	Fuses
Section 262818 -	Enclosed Switches
Section 263213 -	Engine Generator (Alternate)
Section 263213 -	Engine Generator
Section 263600 -	Transfer Switches
Section 264300 -	Surge Protective Devices
Section 265100 -	Interior Lighting

## **DIVISION 27 – COMMUNICATIONS**

Section 271005 -	Structured Cabling for Voice and data
Section 275319 -	Emergency Responder Radio Communication System

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

Section 284600 - Fire Detection and Alarm  
Section 285500 - RF Survey for Emergency Responder Radio Antenna

**DIVISION 31 – EARTHWORK**

Section 312316.13 - Trenching

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

TBD

**DIVISION 33 – UTILITIES**

Section 337119 - Underground Ducts

**DIVISION 34 – TRANSPORTATION**

N/A

END OF TABLE OF CONTENTS



## **SECTION 031000 - CONCRETE FORMING AND ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Form-facing material for cast-in-place concrete.
  - 2. Shoring, bracing, and anchoring.
- B. Related Documents:
  - 1. Specification Section 032000 – Concrete Reinforcing
  - 2. Specification Section 033000 – Cast-in-Place Concrete
  - 3. Specification Section 033050 – Cast-in-Place Concrete Slabs

#### **1.3 REFERENCE DOCUMENTS**

- A. American Concrete Institute (ACI):
  - 1. ACI 117 – Specification for Tolerances for Concrete Construction and Materials
  - 2. ACI 315 – Guide to Presenting Reinforcing Steel Design Details
  - 3. ACI 318 – Building Code Requirements for Structural Concrete
  - 4. ACI 347 – Guide to Formwork for Concrete
- B. American National Standards Institute (ANSI).
- C. American Plywood Association (APA).
- D. ASTM International (ASTM).
- E. National Institute of Standards and Technology (NIST).
- F. NSF International (NSF).
- G. Codes and regulations of jurisdictional authorities.

#### **1.4 DEFINITIONS**

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while

the concrete is setting and gaining sufficient strength to be self-supporting.

- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

## 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at a location determined by GC.

- 1. Review the following:
  - a. Special inspection and testing and inspecting agency procedures for field quality control.
  - b. Construction, movement, contraction, and isolation joints
  - c. Forms and form-removal limitations.
  - d. Anchor rod and anchorage device installation tolerances.

## 1.6 ACTION SUBMITTALS

- A. Product Data: For each of the following:

- 1. Exposed surface form-facing material.
- 2. Concealed surface form-facing material.
- 3. Form ties.
- 4. Waterstops.
- 5. Form-release agent.

- B. Shop Drawings: Detailing fabrication, assembly, and support of forms.

- 1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
- 2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
- 3. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.

## 1.7 QUALITY ASSURANCE

- A. Testing and Inspection Agency: provided by the Township.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic

loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

## 2.2 FORM-FACING MATERIALS

### A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 03 3000 "Cast-In-Place Concrete, and as follows:
  - a. Plywood, metal, or other approved panel materials.
  - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - 1) APA HDO (high-density overlay).
    - 2) APA MDO (medium-density overlay); mill-release agent treated, and edge sealed.
    - 3) APA Structural 1 Plyform, B-B or better; mill oiled, and edge sealed.
    - 4) APA Plyform Class I, B-B or better; mill oiled, and edge sealed.

### B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

### C. Forms for Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces without spiral or vertical seams not exceeding specified formwork surface class.

1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

## 2.3 RELATED MATERIALS

- A. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

- C. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- D. Waterstops: Self-expanding butyl strip, manufactured in rectangular or trapezoidal form, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
  - 1. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Colloid Environmental Technologies Company: Volclay Waterstop-RX
    - b. Greenstreak: Swellstop
    - c. Henry Company, Sealants Division: Hydro-Flex
    - d. W. R. Meadows: Waterstop EC/EC Plus
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

## 2.5. STEEL REINFORCEMENT

- A. Refer to Section 032000 "Concrete Reinforcing" for Steel Reinforcement requirements.

## 2.6 REINFORCEMENT ACCESSORIES

- B. Refer to Section 032000 "Concrete Reinforcing" for Reinforcement Accessory requirements.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.

- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
  - 1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
  - 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
  - 3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
  - 1. Minimize joints.
  - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
  - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
  - 2. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
  - 1. Provide and secure units to support screed strips
  - 2. Use strike-off templates or compacting-type screeds.
- H. Chamfer, where indicated on contract documents or details, exterior corners and edges of permanently exposed concrete.
- I. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
  - 1. Determine sizes and locations from trades providing such items.
  - 2. Obtain written approval of The Engineer prior to forming openings not indicated on Drawings.
- K. Construction and Movement Joints:
  - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.

2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  3. Locate vertical joints in walls as indicated on Drawings.
- L. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- M. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- N. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- O. Earth-forming is permitted to construct isolated column footings and continuous wall footings:
1. Earth-formed footing dimensions shall be no less than the footing dimensions specified on the Contract Documents.
  2. Sides of earth-formed excavations shall be sloped as dictated by soil conditions to prevent soil from sloughing into excavated area and wet concrete.
  3. Ensure tops of footings are placed in accordance with the elevations specified on the Contract Documents.

### 3.2 INSTALLATION OF 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 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.
  4. Clean embedded items immediately prior to concrete placement.

### 3.3 INSTALLATION OF WATERSTOPS

- A. Install in construction joints as indicated on Drawings; install in longest lengths practicable; protect exposed waterstops during progress of Work.

### 3.4 REMOVING AND REUSING FORMS

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to

not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support 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.
1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
  2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
1. Align and secure joints to avoid offsets.
  2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

END OF SECTION 031000

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## **SECTION 032000 - CONCRETE REINFORCING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Steel reinforcement bars.
  - 2. Synthetic fiber reinforcing.
- B. Related Documents:
  - 1. Specification Section 031000 – Concrete Forming and Accessories
  - 2. Specification Section 033000 – Cast-in-Place Concrete
  - 3. Specification Section 033050 – Cast-in-Place Concrete Slabs
  - 4. PennDOT Bulletin 15 (Publication 35) – Qualified Products List for Construction: reference for epoxy-coated reinforcing bars

#### **1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at a location determined by DBC.
  - 1. Review the following:
    - a. Special inspection and testing and inspecting agency procedures for field quality control.
    - b. Construction contraction and isolation joints.
    - c. Steel-reinforcement installation.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For the following:
  - 1. Each type of steel reinforcement.
  - 2. Bar supports.
- B. Shop Drawings: Comply with ACI SP-066:
  - 1. Include placing drawings that detail fabrication, bending, and placement.

2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
  1. Location of construction joints is subject to approval of the Professional.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing to be provided by the Township.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
  1. Store reinforcement to avoid contact with earth.

## PART 2 - PRODUCTS

### 2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A82, as drawn.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets; do not use rolls.
- D. Epoxy-Coated Reinforcing Bars: ASTM A615, Grade 60, deformed bars; ASTM A775, epoxy-coated after fabrication and bending.
  1. Refer to PennDOT Bulletin 15.

### 2.2 FIBER REINFORCEMENT

- A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 3/4 to 1-1/2 inches long. Available manufacturers:
  - a. Euclid Chemical Company.
  - b. FORTA Corporation.
  - c. Grace Construction Products, W. R. Grace & Co.

2. Minimum dosage rate where required: 1.5 lb/cy or higher if recommended by manufacturer.

## 2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Joint Dowel Plates:  $\frac{1}{4}$ " x 4  $\frac{1}{2}$ " x 4  $\frac{1}{2}$ ", ASTM A36 plates.
  1. Basis of Design Product: Diamon Dowel System by PNA Corporation Technologies ([www.pna-inc.com](http://www.pna-inc.com)), or accepted equivalent.
  2. Install at locations shown on Drawings.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
  1. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete and as follows:
    - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
  1. Finish: Plain.
- E. Stainless Steel Tie Wire: ASTM A1022/A1022M, not less than 0.0508 inch in diameter.

## 2.4 FABRICATING REINFORCEMENT

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

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection of In-Place Conditions:
  1. Do not cut or puncture vapor barrier.
  2. Repair damage and reseal vapor barrier before placing concrete.

### 3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- 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.
  - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
  - 2. Do not tack weld crossing reinforcing bars.
- D. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- E. Provide concrete coverage in accordance with ACI 318.
- F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- G. Splices: Lap splices as indicated on Drawings; stagger splices in accordance with ACI 318.
- H. Install welded-wire reinforcement sheets in longest practicable lengths.
  - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
    - a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.
  - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
  - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
  - 4. Lace overlaps with wire.

### 3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by The Engineer.
  - 1. Place joints perpendicular to main reinforcement.

2. Continue reinforcement across construction joints unless otherwise indicated.
  3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

#### 3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

END OF SECTION 032000

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## **SECTION 033000 - CAST-IN-PLACE CONCRETE**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls.
  - 3. Piers.
  - 4. Storage Bin walls.
- B. Related Documents
  - 1. Specification Section 031000 – Concrete Forming and Accessories
  - 2. Specification Section 032000 – Concrete Reinforcing
  - 3. Specification Section 033050 – Cast-in-Place Concrete Slabs
  - 4. PennDOT Bulletin 15

#### **1.3 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

#### **1.4 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.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.

- C. Qualification Data: For installer and manufacturer.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates.
- E. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
- F. Minutes of pre-installation conference.

#### 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."
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete,"
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- E. Strength Requirements: If compressive strength of in-situ concrete is accepted, either without additional testing or based on testing other than original cylinder compressive strength tests, the GC shall compensate the Township for the GCs failure to meet specified strength requirements by paying to the Township one hundred dollars (\$100) per cubic yard for each one hundred pounds per square inch (100psi) below the specified compressive strength. The original laboratory cured 28-day cylinder compressive strength results only shall be used to determine the difference between specified and furnished strengths.
- F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01.



1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
  - a. Contractor's superintendent.
  - b. Independent testing agency responsible for concrete design mixtures.
  - c. Ready-mix concrete manufacturer.
  - d. Concrete subcontractor.
  - e. Construction Manager.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, vapor-barrier installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

## PART 2 - PRODUCTS

### 2.1 AVAILABLE PRODUCTS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

### 2.2 FORM-FACING MATERIALS

- A. Refer to Section 031000 "Concrete Forming and Accessories" for Form-Facing requirements.

### 2.3 STEEL REINFORCEMENT

- A. Refer to Section 031000 "Concrete Forming and Accessories" for Steel Reinforcement requirements.

### 2.4 REINFORCEMENT ACCESSORIES

- A. Refer to Section 031000 "Concrete Forming and Accessories" for Reinforcement Accessory requirements.

## 2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I; Type II for use in Building C Bin Walls
  - 2. Fly Ash: ASTM C 618, Class F.
  - 3. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates for all areas, except slabs: ASTM C 33, coarse aggregate or better, uniformly graded. Provide aggregates from a single source.
  - 1. Use largest practical aggregate size for each mix specification.
  - 2. Both coarse and fine aggregates free of materials with deleterious reactivity to alkali in cement.
- C. Water: Clean and potable, complying with ASTM C94.

## 2.6 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.

## 2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  - 1. Available Products:
    - a. Euclid Chemical Company (The); Eucobar.
    - b. L&M Construction Chemicals, Inc.; E-Con.
    - c. Meadows, W. R., Inc.; Sealtight Evapre.
- B. Water: Potable.

- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
  - 1. Available Products:
    - a. Euclid Chemical Company (The); Kurez DR VOX.
    - b. L&M Construction Chemicals, Inc.; L&M Cure R.
    - c. Meadows, W. R., Inc.; 1100 Clear.

## 2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

## 2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, pozzolan, and ground granulated blast-furnace slag as needed to reduce the total amount of Portland cement, which would otherwise be used. Limit percentage, by weight, of cement-replacement materials to a combined total of no more than 20-percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions, and as required for concrete placement and workability.

## 2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings, foundation walls, and piers: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4,000 psi at 28 days.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
  - 3. Slump Limit: 5 inches, plus or minus 1 inch (without superplasticizer).
  - 4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
  - 5. Coarse/Fine Aggregate Ratio: Quantity (by weight) of coarse aggregate shall be in the approximate range of 1.2- to 1.4-times the quantity of fine aggregate.
  - 6. Exposure Class: ACI318 – F1, S0, W0, C1

B. Building C Bin Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4,500 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 5 inches, plus or minus 1 inch (without superplasticizer).
4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Coarse/Fine Aggregate Ratio: Quantity (by weight) of coarse aggregate shall be in the approximate range of 1.2- to 1.4-times the quantity of fine aggregate.
6. Exposure Class: ACI318 – F2, S1, W1, C1

2.11 CONCRETE MIXING

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

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

- A. Refer to Section 031000 "Concrete Forming and Accessories" Installation of Embedded Items for requirements.

3.2 REMOVING AND REUSING FORMS

- A. Refer to Section 031000 "Concrete Forming and Accessories" Removing and Reusing Forms for requirements.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. See Specification Section 032000 "Concrete Reinforcing" for Installation of Steel Reinforcement for requirements.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
  3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

### 3.5 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 Material Testing Technician.
- 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.

### 3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.7 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.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

### 3.8 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. 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.
2. 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.

### 3.9 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

### 3.10 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, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to The Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to The Engineer's approval.

### 3.11 FIELD QUALITY CONTROL

- A. Special Inspections: The Township will engage a special inspector to perform field inspections and prepare test reports.
- B. Testing Agency: The Township will engage a qualified testing agency to perform concrete material tests.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
  - 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 6. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and laboratory-cure two sets of two standard cylinder specimens for each composite sample.
    - b. Cast and field-cure two sets of two standard cylinder specimens for each composite sample.
  - 7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days, one set of two specimens at 28 days and one set of two specimens at 56 days.
    - a. Test one set of two field-cured specimens at 7 days, one set at 28 days and one set at 56 days.
    - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion 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).
  10. Test results shall be reported in writing to the Township, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests, and at 56-days when required.
  11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Township but will not be used as sole basis for approval or rejection of concrete.
  12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by the Township. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Township.
  13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced work with specified requirements.
  14. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Where earth-forming methods are used to construct footings, it is the responsibility of the Contractor placing the concrete to ensure that the foundation elements are constructed to accurate dimensions and elevations. It is also the responsibility of the Contractor placing the concrete to correct any deficiencies or errors that affect the Work of other trades. Any corrective work shall be performed at the expense of the Contractor responsible for placing the concrete.

END OF SECTION 033000

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## **SECTION 033050 - CAST-IN-PLACE CONCRETE SLABS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 WORK INCLUDED**

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, concrete topping, placement procedures and finishes.
  - 1. On-grade concrete slabs.
- B. Related Documents
  - 1. Specification Section 031000 – Concrete Forming and Accessories
  - 2. Specification Section 032000 – Concrete Reinforcing
  - 3. Specification Section 033000 – Cast-in-Place Concrete
  - 4. Specification Section 051200 – Structural Steel Framing

#### **1.3 REFERENCE DOCUMENTS**

- A. American Concrete Institute (ACI).
- B. American National Standards Institute (ANSI).
- C. American Plywood Association (APA).
- D. ASTM International (ASTM).
- E. Concrete Reinforcing Steel Institute Standards (CRSI).
- F. National Institute of Standards and Technology (NIST).
- G. NSF International (NSF).
- H. Codes and regulations of jurisdictional authorities.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results or other circumstances warrant adjustments.
- C. Construction and Contraction Joint Layout Drawings with joints clearly labeled, for on-grade slabs. Refer to Drawings for additional information.
- D. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
  - 1. Cementitious materials and aggregates.
  - 2. Admixtures.
  - 3. Curing materials.
  - 4. Floor and slab treatments.
  - 5. Bonding agents.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work 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.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Comply with applicable articles of Division 01 Section "Quality Assurance Testing and Inspection Services." The Township will engage a qualified independent testing and inspecting agency.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from 1 source, and each admixture from the same manufacturer.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

## PART 2 - PRODUCTS

### 2.1 STEEL REINFORCEMENT

- A. Refer to Section 032000 "Concrete Reinforcing" for Steel Reinforcement requirements.

### 2.2 VAPOR BARRIER

- A. Plastic Vapor Barrier: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive tape.
  - 1. Available Products:
    - a. Henry Company; Moistop Ultra 10.
    - b. Raven Industries Inc.; Vapor Block VB10.
    - c. Stego Industries, LLC; Stego Wrap, 10-mil.

### 2.3 REINFORCEMENT ACCESSORIES

- A. See Section 032000 "Concrete Reinforcing" for Reinforcement Accessory requirements.

### 2.4 CONCRETE MATERIALS

- A. Refer to Section 033000 "Cast-In-Place Concrete" for Concrete Material requirements.
- B. Normal-weight Aggregates: ASTM C33, uniformly graded and as follows:
  - 1. Use largest practical aggregate size for each mix specification and application.

### 2.5 ADMIXTURES

- A. Refer to Section 033000 "Cast-In-Place Concrete" for Admixture requirements.

## 2.6 CURING MATERIALS

- A. Refer to Section 033000 "Cast-In-Place Concrete" for Curing Material requirements.

## 2.7 RELATED MATERIALS

- A. Refer to Section 033000 "Cast-In-Place Concrete" for Related Material requirements.

## 2.8 CONCRETE MIXES, GENERAL

- A. Refer to Section 033000 "Cast-In-Place Concrete" for Concrete Mix requirements.

## 2.9 CONCRETE MIXTURES FOR CONCRETE SLABS

- A. On-Grade Interior Slabs: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4,000 psi at 28 days.
  - 2. Maximum Cementitious Materials Content: 564 lb/cu. yd.
  - 3. Slump Limit: 5 inches, plus or minus 1 inch (without superplasticizer).
  - 4. Air Content: Limit to entrapped air. Do not use air-entraining admixtures.
  - 5. Coarse/Fine Aggregate Ratio: Quantity of coarse aggregate (by weight) shall be in the approximate range of 1.2- to 1.4-times the quantity of fine aggregate (by weight).
- B. On-Grade Exterior Slabs: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4,500 psi at 28 days.
  - 2. Maximum Cementitious Materials Content: 611 lb/cu. yd.
  - 3. Slump Limit: 5 inches, plus or minus 1 inch (without superplasticizer).
  - 4. Air Content: 5 percent, plus or minus 1.5 percent, for 1-inch nominal maximum aggregate size.
  - 5. Coarse/Fine Aggregate Ratio: Quantity of coarse aggregate (by weight) shall be in the approximate range of 1.2- to 1.4-times the quantity of fine aggregate (by weight).
- C. On-Grade Slabs in Building C Bins: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 5,000 psi at 28 days.
  - 2. Maximum Cementitious Materials Content: 658 lb/cu. yd.
  - 3. Slump Limit: 5 inches, plus or minus 1 inch (without superplasticizer).
  - 4. Air Content: 5 percent, plus or minus 1.5 percent, for 1-inch nominal maximum aggregate size.
  - 5. Coarse/Fine Aggregate Ratio: Quantity of coarse aggregate (by weight) shall be in the approximate range of 1.2- to 1.4-times the quantity of fine aggregate (by weight).



6. Exposure Class: ACI318 – F2, S1, W1, C1

## 2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
  - 1. When air temperature is between 85°F and 90°F (30°C and 32°C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK

- A. Refer to Section 03 1000 Concrete Forming and Accessories for requirements.

### 3.2 EMBEDDED ITEMS

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

### 3.3 VAPOR BARRIERS

- A. Plastic Vapor Barriers: Place, protect, and repair vapor barriers according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

### 3.4 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. See Specification Section 032000 "Concrete Reinforcing" Installation of Steel Reinforcement for requirements.

### 3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Structural Engineer.
  - 1. Install edge forms with joint dowel plates across construction joint locations.
- C. Contraction/Control Joints in On-Grade Slabs: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least 1/4 of concrete thickness, as follows:
  - 1. Sawed Joints: Form contraction joints with soft-cut saws in accordance with ACI.
- D. Isolation Joints in On-Grade Slabs: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams and other locations, as indicated.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
  - 2. Terminate full-width joint-filler strips not less than 1/2" (12 mm) or more than 1" (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
  - 3. Install joint-filler strips in lengths as long as practicable. Where more than 1 length is required, lace or clip sections together.

### 3.6 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. Batch ticket for concrete shall clearly indicate mix design numbers which correlates with approved mix design.
- C. Do not add water to concrete during delivery, at Project site or during placement, unless approved by the Testing Lab Technician.
- D. 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, free of humps or hollows, before excess moisture or bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. 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 air temperature has fallen to or is expected to fall below 40°F (4.4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C) and not more than 80°F (27°C) at point of placement.
  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 mix designs.
- F. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90°F (32°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. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  3. Fog-spray forms, steel reinforcement and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots or dry areas.

### 3.7 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, 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 to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish at all Interior floors: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
- E. Broom Finish: Use a horsehair broom on a bull float handle. Apply a broom finish to exterior concrete pads, Storage Bin slab, and elsewhere as indicated.
  1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with the Township before application.

### 3.8 FLOOR SLAB FLATNESS AND LEVELNESS

- A. Definitions:
  1.  $SOF_F$  – Specified Overall Flatness Value
  2.  $SOF_L$  – Specified Overall Levelness Value
  3.  $MLF_F$  - Specified Minimum Local Flatness Value
  4.  $MLF_L$  – Specified Minimum Local Levelness Value
- B. For all locations of on-grade concrete slabs, the flatness and levelness requirements are as follows:
  1.  $SOF_F$ -19 and  $MLF_F$ -13
  2.  $SOF_L$ -13 and  $MLF_L$ -10

### 3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete slabs from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. **ALL ON-GRADE CONCRETE SLABS SHALL BE WET-CURED FOR A MINIMUM OF SEVEN (7) DAYS. BEGIN CURING IMMEDIATELY AFTER FINISHING.**
  1. Keep surfaces continuously wet 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 overlap of adjacent materials.
2. Dedicate workers to maintain covering in place for the initial 7-day duration.
3. Curing compounds are not a substitute for wet curing concrete slabs.

### 3.10 JOINT FILLING

- A. Prepare, clean and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds and sealers from joints; leave contact faces of joint clean and dry.

### 3.11 FIELD QUALITY CONTROL

- A. General:
  1. Concrete materials and operation will be tested and inspected as work progresses. 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 Structural Engineer for final acceptance.
  2. Comply with Division 01 Section "Quality Control Testing Services" for sampling and testing of concrete.
  3. Testing of field curing test cylinders or testing required because of changes in materials or proportions of the mix requested by the Contractor, as well as any extra testing of concrete or materials occasioned by their failure to meet specification requirements, shall be at the Contractor's expense.
- B. Testing Services by Quality Control Agency:
  1. The Township reserves the right to have check tests performed in accordance with Division 01 Section "Quality Assurance Testing and Inspection Services" on any and all testing and inspections required by Division 01 Section "Quality Control Testing Services."
  2. Conduct strength tests of the concrete in accordance with the following procedures:
    - a. The responsible Contractor shall secure composite samples in accordance with "Method of Sampling Fresh Concrete" (ASTM C172). Each strength test shall be obtained from a different batch of concrete on a representative, truly random basis. When pumping or pneumatic equipment is used, samples shall be taken at the discharge end. The cylinders shall be molded and 24 hour initial curing provided, in strict compliance with ASTM C31. Immediately thereafter a responsible representative of the Quality Control Agency shall pack them in a sturdy container, furnished by the responsible Contractor and as approved by the Quality Control Agency, protect them from freezing and transport them to the laboratory where they

shall be cured in strict compliance with ASTM C31 until time of test. The cylinders shall be sequentially numbered and a record of date made and date transported to the laboratory kept by the Testing Lab. A copy of this record shall be forwarded to the Township. Unless this record reflects any exceptions, it will be assumed that these procedures have been followed to the mutual satisfaction of the Contractor, the testing laboratory, and the Township.

- b. Specimens shall be tested in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C39). 2 specimens shall be tested at 28 days for acceptance, 2 shall be tested at 7 days for information and 2 shall be tested at 56 days for record. The acceptance test results shall be the average of the strengths of the 2 specimens tested at 28 days. If 1 specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens in a test show any of the above defects, the entire test shall be discarded. When high early strength concrete is used, the specimens shall be tested at the ages indicated in the contract documents.
- c. Samples for strength tests of each class of concrete (each concrete mix design) shall be taken not less than once a day nor less than once for each 100 cu.yd. of concrete or for each 3000 sq.ft. of surface area placed. Not less than 5 strength tests (6 cylinders per test) shall be conducted for each concrete mix design.
  - 1) The air content of concrete of normal weight shall be determined on a regular and frequent basis in accordance with either "Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method" (ASTM C231), "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C173) or "Method of Test for weight per Cubic Foot, Yield and Air Content (Gravimetric) of Concrete" (ASTM C138).

**END OF SECTION 033050**

## **SECTION 042000 - UNIT MASONRY**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Concrete masonry units.
  - 2. Decorative concrete masonry units
  - 3. Mortar and grout.
  - 4. Steel reinforcing bars.
  - 5. Masonry joint reinforcement.
  - 6. Ties and anchors.
  - 7. Embedded flashing.
  - 8. Weeps.
  - 9. Miscellaneous masonry accessories.

#### **1.3 DEFINITIONS**

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

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling.
- B. Selection Samples: For each finish product specified, two complete sets of brick samples showing range of color and texture to be expected.
- C. Verification Samples: For each finish product specified, two samples representing actual color and texture of the brick specified.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

F. Samples for Initial Selection:

1. Weep holes/vents.
2. Mechanically-fastened anchors.

## 1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.
  - a. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
  - b. For exposed brick, include test report for efflorescence according to ASTM C 67.
  - c. Concrete Masonry Units.
2. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
3. Cementitious materials. Include brand, type, and name of manufacturer.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

## 1.6 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- D. Preinstallation Conference: Conduct conference at Project site.



1. Convene at the Project site minimum two weeks prior to starting work of this section to discuss:
  - a. Method and sequence of masonry construction.
  - b. Special masonry details.
  - c. Standard of workmanship.
  - d. Quality control requirements.
  - e. Job organization.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store materials in the manufacturer's unopened packaging with manufacturer's identification and labels intact until ready for installation.
- B. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- 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 aggregates where grading and other required characteristics can be maintained and contamination avoided.
- E. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- F. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

### 2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  2. Provide bullnose units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
  1. Density Classification: Normal weight.
    - 1) Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions of 4, 6, 8, 12, 14, and 16 inches.

### 2.3 DECORATIVE CONCRETE MASONRY UNITS

- A. Size and Shape: Nominal face dimension of 8 by 16 inches; thicknesses of 4 inches and 8 inches. Provide special shapes with ground face on exposed faces for 90-degree corners. Provide smooth return at door jambs and louver frames.

- B. Decorative CMUs: ASTM C 90; 2-core, normal weight; ground-faced exposed faces with integral water repellent; integral color as selected from manufacturer's standard range.
- C. Basis-of-Design Product: Subject to compliance with requirements, provide Trendstone Plus by Trenwythe Industries.
- D. Color: From manufacturer's standard color options, provide three colors:
  - 1. Base color – Building A Gridlines 1-3.
  - 2. Base color – Building A Gridlines 3-16 and Building B.
  - 3. Sill trim color.
- E. Integral Water Repellent: Provide units made with integral water repellent.
  - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) BASF Aktiengesellschaft; Rheopel Plus.
      - 2) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block

## 2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: Not permitted.
- E. Aggregate for Mortar: ASTM C 144.
  - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
  - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
  - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
  - 5. Color as selected for Decorative CMU.

- F. Aggregate for Grout: ASTM C 404.
- G. Admixtures: Not permitted.
- H. Water: Potable.

## 2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
  - 1. Interior Walls: Hot-dip galvanized, carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
  - 3. Wire Size for Side Rods: 0.148-inch diameter.
  - 4. Wire Size for Cross Rods: 0.148-inch diameter.
  - 5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
  - 6. Provide in lengths of not less than 10 feet.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

## 2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
  - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
  - 2. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Adjustable Anchors for Connecting to Concrete: Provide seismic-rated anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
  - 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- thick, steel sheet, galvanized after fabrication.
    - a. 0.064-inch thick, galvanized sheet may be used at interior walls unless otherwise indicated.
  - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
  - 3. Alternate Anchor System for Connecting to Concrete:
    - a. HB-213-2X anchor/tie system (by Hohmann & Barnard or accepted equivalent) with seismic clip and continuous horizontal joint wire in stack-bond brick masonry veneer.
    - b. Gripstay 362 Channel, mechanically fastened to concrete wall, with 363-BL Gripstay anchor (by Hohmann & Barnard or accepted equivalent) and continuous horizontal joint wire in stack-bond brick masonry veneer.

- C. Adjustable Anchors for Connecting to Concrete Masonry Units: Provide seismic-rated anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
  - 1. Basis of Design: 270-2X S.I.S. Ladder, Adjustable Ladder Eye-Wire & Seismicclip Interlock, as manufactured by Hohmann & Barnard, Inc. Provide with continuous reinforcement wire within masonry veneer bed joint for all stack-bond installations.
- D. Adjustable Anchors for Connecting to Steel Studs: Provide seismic-rated anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
  - 1. Basis of Design: Thermal 2-Seal, Adjustable Veneer Anchor, as manufactured by Hohmann & Barnard, Inc. Provide with continuous reinforcement wire within masonry veneer bed joint for all stack-bond installations.

## 2.7 EMBEDDED FLASHING MATERIALS

### A. Metal Flashing:

- 1. Provide 26 gage stainless steel flashing. When thru-wall flashing at roof rising wall is exposed to building occupants from building windows or at grade, it shall be Follonbee's TCS II.
- 2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
  - 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) York Manufacturing, Inc.; Multi-Flash SS.
    - 2) Illinois Products, Inc.; IPCO Stainless Steel Fabric Flashing.
    - 3) Prosoco, Inc.; R-Guard SS ThruWall.
    - 4) STS Coatings, Inc.; Wall Guardian Stainless Steel TWF.
    - 5) TK Products, Inc.; TK TWF.
  - b. Type: Stainless steel core with polymer fabric laminated to the bottom stainless steel face with non-asphalt adhesive. The top face (exposed side) must not be covered with a polymer fabric.
  - c. Stainless steel: type 304, ASTM A240. Domestically sourced per DFARS 252.225-7008 and/or DFARS 252.225-7009.
  - d. Fabric: polymer fabric; laminated back face (non-exposed side) of stainless-steel core.
  - e. Size: Manufacturer's standard width rolls.
- 3. Thru-Wall Flashing for CMU at Grade: Top flange shall extend through masonry back-up wall and have an up-turned seam inside. Bottom edge shall project

through mortar face 3/16 inch. Round the corners of the bottom edge at outside building corners. Turn down the bottom edge of flashing to be flush with the face of veneer below to prevent sharp edges at building corners.

4. Flexible flashing shall be installed at all relief angles and masonry cavity wall openings.
5. Fabricate through-wall flashing for Architectural Face Brick with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees.

B. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C 920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

## 2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

## 2.9 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc.

## 2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use Portland cement-lime mortar unless otherwise indicated.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  - 1. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls, interior load-bearing walls, and for other applications where another type is not indicated, use Type S.
  - 2. For exterior veneers and interior non-load-bearing partitions use Type N.
  - 3. Admixtures in mortar are not permitted.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
  - 1. Use either fine or coarse grout that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  - 2. Proportion grout in accordance with ASTM C 476, Proportion Specification.
  - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
  - 4. Admixtures in grout are not permitted.
- D. Masonry Cavity Fill: Provide Vermiculite loose fill insulation in CMU cores where noted on drawings to provide increased R value.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.

- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

### 3.3 TOLERANCES

#### A. Dimensions and Locations of Elements:

- 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
- 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
- 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

#### B. Lines and Levels:

- 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
- 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
- 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
- 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 3/8 inch maximum.
- 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

#### C. Joints:

- 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
- 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
- 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.



4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- G. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
  1. Install compressible filler in joint between top of partition and underside of structure above.
  2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- B. Lay CMUs as follows:
  1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.

3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
1. Space reinforcement not more than 16 inches o.c.
  2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### 3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
  2. Install preformed control-joint gaskets designed to fit standard sash block.
  3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
  4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.

### 3.9 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  2. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under building paper or building wrap, lapping at least 4 inches (100 mm).
  3. At stud back-up walls, extend flashing from exterior face of veneer, through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building paper or building wrap, lapping at least 8 inches.
  4. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 4 inches to form end dams.
  5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 4 inches or as recommended by flashing manufacturer, and seal lap with two beads of elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated. Provide factory soldered corners with 18-inches minimum legs.
    - a. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
    - b. Solder corners and level changes to be watertight.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
  - 1. Use specified weep/vent products to form weep holes.
  - 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
  - 3. CMU: Space weep holes 32 inches o.c. unless otherwise indicated.
- E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

### 3.10 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
  - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  - 2. Limit height of vertical grout pours to not more than 60 inches.

### 3.11 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.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

### 3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Masonry Waste: Remove excess clean masonry waste and legally dispose of off Township's property.

END OF SECTION 042000

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## **SECTION 051200 - STRUCTURAL STEEL FRAMING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Structural steel.
  - 2. Shrinkage-resistant grout.
- B. Related Requirements:
  - 1. Section 099113 "Exterior Painting".

#### **1.3 DEFINITIONS**

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

#### **1.4 COORDINATION**

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

#### **1.5 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at location to be determined by the GC.

#### **1.6 ACTION SUBMITTALS**

- A. Product Data:

1. Structural-steel materials.
  2. High-strength, bolt-nut-washer assemblies.
  3. Anchor rods.
  4. Shop primer.
  5. Shrinkage-resistant grout.
- B. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  2. Include embedment Drawings.
  3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
  4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
  5. Identify members not to be shop primed.
- C. Delegated-Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional responsible for their preparation.

## 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer fabricator.
- B. Welding certificates.
- C. Mill test reports for structural-steel materials, including chemical and physical properties.
- D. Product Test Reports: For the following:
1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
- E. Field quality-control reports.

## 1.8 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and



FCAW-G shall be considered separate processes for welding personnel qualification.

- B. Fabricator Qualifications: A qualified fabricator with not less than ten (10) years of experience with structures of complexity similar to that indicated for this Project.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided The Township's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
  - 1. ANSI/AISC 303.
  - 2. ANSI/AISC 341.
  - 3. ANSI/AISC 360.
  - 4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

### 2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992/A992M ASTM A572/A572M, Grade 50.
- B. Channels, Angles: ASTM A36/A36M.
- C. Plate and Bar: ASTM A36/A36M.

- D. Cold-Formed Hollow Structural Sections (HSS): ASTM A500, Grade B.
- E. Welding Electrodes: Comply with AWS requirements.
- F. Anchor Rods: ASTM F1554 Grade 36 UNO.

## 2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

## 2.4 PRIMER

- A. Steel Primer:
  - 1. Comply with Section 099113 "Exterior Painting".
  - 2. SSPC-Paint 23, latex primer.
  - 3. Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

## 2.5 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible.
  - 1. Camber structural-steel members where indicated.
  - 2. Fabricate beams with rolling camber up.
  - 3. Mark and match-mark materials for field assembly.
  - 4. Complete structural-steel assemblies, including welding of units, before starting shop- priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

## 2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

## 2.8 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
  - 1. SSPC-SP 2.
- C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection.

## 2.9 GALVANIZING

- A. Hot-Dipped Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123.
- B. Items to be hot-dipped galvanized are indicated on Drawings.

## 2.10 FIELD-APPLIED RUST-INHIBITIVE COATING

- A. Apply coatings as indicated on Drawings.

- B. Prepare surfaces to be field-coated by SSPC-SP2 Hand Tool Cleaning to remove all loose rust, scale, dirt, etc.
- C. Apply two (2) coats of rust-inhibitive coating by brush or spray.
- D. Products that may be incorporated include, but are not limited to:
  - 1. Heavy-Duty Rust Inhibitive Primer, 7400 System, by Rust-Oleum Corp.
  - 2. Steel Spec Rust Inhibitive Primer, by The Sherwin-Williams Co.
  - 3. 99-Series Heavy Duty Inhibitive Primer, by Sumter Coatings, Inc.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
  - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates, Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
- E. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

### 3.5 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting."

### 3.6 FIELD QUALITY CONTROL

- A. Special Inspections: The Township will engage a special inspector to perform the following special inspections:
  1. Verify structural-steel materials and inspect steel frame joint details.
  2. Verify weld materials and inspect welds.
  3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: The Township will engage a qualified testing agency to perform tests and inspections.
  1. Bolted Connections: Visually inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
  2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
    - a. In addition to visual inspection, test and inspect Partial or Complete Joint Penetration field welds in accordance with AWS D1.1/D1.1M and one of the following inspection procedures, at the Township's option:
      - 1) Liquid Penetrant Inspection: ASTM E165/E165M.
      - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      - 3) Ultrasonic Inspection: ASTM E164.
      - 4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION 051200

## **SECTION 055000 - METAL FABRICATIONS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Steel framing and supports for countertops.
  - 2. Steel framing and supports for mechanical and electrical equipment.
  - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 4. Metal ladders.
  - 5. Metal bollards.

#### **1.3 PERFORMANCE REQUIREMENTS**

- A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

#### **1.4 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Metal nosings and treads.
  - 2. Paint products.
  - 3. Grout.

- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
  - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
  - 2. Provide templates for anchors and bolts specified for installation under other Sections.
  - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- D. Welding certificates.
- E. Qualification Data: For professional engineer.

#### 1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.6, "Structural Welding Code--Stainless Steel."

#### 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications 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 dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
  - 2. Provide allowance for trimming and fitting at site.

#### 1.7 COORDINATION

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



## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Provide signed and sealed engineering drawings and calculations, including comprehensive engineering analysis by a qualified professional engineer. This documentation shall be provided as described as part of item 1.4-B above.

### 2.3 METALS, GENERAL

- 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.

### 2.4 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- F. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches or as indicated.
  - 2. Material: Galvanized steel complying with ASTM A 653/A 653M, commercial steel, Type B.
  - 3. Material: Steel complying with ASTM A 1008/A 1008M, commercial steel, Type B; unfinished, coated with rust-inhibitive, baked-on, acrylic enamel, and hot-dip galvanized after fabrication.

## 2.5 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).
- D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material for Anchors in Exterior Locations: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

## 2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 9 painting Sections.
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
  - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Available Products:
  - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
  - b. Carboline Company; Carbozinc 621.
  - c. ICI Devoe Coatings; Catha-Coat 313.
  - d. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
  - e. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
  - f. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

## 2.7 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.8 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 retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

## 2.9 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

## 2.10 MISCELLANEOUS STEEL TRIM

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

## 2.11 METAL LADDERS

- A. General:
  - 1. Comply with ANSI A14.3, unless otherwise indicated.
  - 2. For elevator pit ladders, comply with ASME A17.1.
  - 3. Space siderails 18 inches apart, unless otherwise indicated.
  - 4. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted brackets, made from same metal as ladder.
- B. Steel Ladders:
  - 1. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
  - 2. Rungs: 3/4-inch- diameter steel bars.
  - 3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
  - 4. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.
  - 5. Available Products:
    - a. IKG Industries, a Harsco company; Mebac.
    - b. W. S. Molnar Company; SlipNOT.
  - 6. Powder coat exterior ladders, including brackets and fasteners.

## 2.12 METAL BOLLARDS

- A. For Protection from standard vehicle traffic, bollards shall be a minimum 8" diameter concrete-filled schedule 80 stainless steel pipe. Where heavy trucks are involved, increase to minimum 10" diameter.
- B. Bollards to be cast into concrete footings, 3'-6" below grade.

## 2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

## 2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
  - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
  - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
  - 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, 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.

## 2.15 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Dull Satin Finish: No. 6.

- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## 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 bolts, 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.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

### 3.3 INSTALLING METAL BOLLARDS

- A. The following methods are acceptable for installation of metal bollards:
1. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each bollard, unless otherwise indicated.
  2. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
  3. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- B. Provide plastic sleeve to cover bollards.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000



## **SECTION 055217 - SAFETY RAILINGS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Manufactured steel wall-mounted Guardrail System.
    - a. Steel railing sizes and shapes as called out in the drawings.
    - b. Steel guard rails with removable sections.

#### **1.3 COORDINATION**

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For the following:
  - 1. Manufacturer's product lines of mechanically connected railings.
  - 2. Railing brackets.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### **1.5 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

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

#### 1.7 FIELD CONDITIONS

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

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Provide products as manufactured by Safety Rail Company, Spring Park, MN; [www.safetyrailcompany.com](http://www.safetyrailcompany.com); email: [sales@safetyrailcompany.com](mailto:sales@safetyrailcompany.com).
- B. Substitutions of equal or greater products are acceptable.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Comply with requirements of applicable local, state, and federal codes.
  - 1. OSHA: 29 CFR 1926.502.
  - 2. OSHA: 29 CFR 1910.29.
  - 3. ASTM Standard E985 Maximum Allowable Deflection under test conditions specified in section 7.1 and 7.2.
- B. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. 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.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

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

## 2.3 EQUIPMENT

- A. Components:
  1. Pit Guardrail: provide in railing lengths as indicated on the drawings.
  2. Finish Type: Powdercoated Yellow.
  3. Brackets: Single-post and Double-post Face Mount brackets as indicated in drawings.
  4. Railing Pin: For use at Removable Guardrail sections.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.2 INSTALLATION, GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. Before installation, inspect all parts to insure no damaged parts are used.

### 3.3 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055217

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## **SECTION 061000 - ROUGH CARPENTRY**

### **PART 1 – GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 DESCRIPTION**

- A. This section specifies wood blocking, framing, sheathing, furring, nailers, sub-flooring, rough hardware, and light wood construction.

#### **1.2 RELATED WORK**

- A. Gypsum sheathing: Section 092900, GYPSUM BOARD.

#### **1.3 SUBMITTALS**

- A. Shop Drawings showing framing connection details, fasteners, connections and dimensions.
- B. Manufacturer's Literature and Data:
  - 1. Submit data for lumber, panels, hardware and adhesives.
  - 2. Submit data for wood-preservative treatment from chemical treatment manufacturer and certification from treating plants that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 3. Submit data for fire retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  - 4. For products receiving a waterborne treatment, submit statement that moisture content of treated materials was reduced to levels specified before shipment to project site.
- C. Manufacturer's certificate for unmarked lumber.

#### **1.4 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Protect lumber and other products from dampness both during and after delivery at site.
- B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.
- C. Stack plywood and other board products so as to prevent warping.

- D. Locate stacks on well drained areas, supported at least 152 mm (6 inches) above grade and cover with well-ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

## 1.5 QUALITY ASSURANCE

- A. Installer: A firm with a minimum of three (3) years' experience in the type of work required by this section.

## 1.6 GRADING AND MARKINGS

- A. Any unmarked lumber or plywood panel for its grade and species will not be allowed on VA Construction sites for lumber and material not normally grade marked, provide manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material meet the specified the specified requirements.

## PART 2 – PRODUCTS

### 2.1 LUMBER

- A. Unless otherwise specified, each piece of lumber must bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.
  - 1. Identifying marks are to be in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
  - 2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.
- B. Structural Members: Species and grade as listed in the AFPA NDS having design stresses as shown.
- C. Lumber Other Than Structural
  - 1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
  - 2. Framing lumber: Minimum extreme fiber stress in bending of 7584 kPa (1100 PSI).
  - 3. Furring, blocking, nailers and similar items 101 mm (4 inches) and narrower Standard Grade; and, members 152 mm (6 inches) and wider, Number 2 Grade.
  - 4. Board Sub-flooring: Shiplap edge, 25 mm (1 inch) thick, not less than 203 mm (8 inches) wide.
- D. Sizes
  - 1. Conforming to PS 20.

2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.

E. Moisture Content

1. Maximum moisture content of wood products is to be as follows at the time of delivery to site.
  - a. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
  - b. Lumber over 50 mm (2 inches) thick: 25 percent or less.

F. Fire Retardant Treatment

1. Comply with Mil Spec. MIL-L-19140.
2. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.

G. Preservative Treatment

1. Do not treat Heart Redwood and Western Red Cedar.
2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 610 mm (24 inches) from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members provided in connection with roofing and flashing materials.
3. Treat other members specified as preservative treated (PT).
4. Preservative treat by the pressure method complying with AWWPA Book use category system standards U1 and T1, except any process involving the use of Chromated Copper Arsenate (CCA) or other agents classified as carcinogenic for pressure treating wood is not permitted.
5. All Preservative Treated Lumber to be 0.6 lb./CF. Provide a signed certification by the wood treatment facility that the wood meets this requirement.

## 2.2 PLYWOOD

A. Comply with PS 1.

- B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type.

C. Sheathing

1. APA rated Exposure 1 or Exterior; panel grade CD or better.
2. Wall sheathing:
  - a. Minimum 11/32 inch thick with supports 16 inches on center and 15/32 inch thick with supports 24 inches on center unless specified otherwise.
  - b. Minimum 48 inches wide at corners without corner bracing of framing.

D. Mezzanine flooring

1. Finish wood flooring:
  - a. APA Rated sheathing, Exposure 1. panel grade AC.
  - b. Minimum  $\frac{3}{4}$ -inch thick with span rating 32/16 or greater for supports at 16 inches on center and 23/32 inch thick with span rating 48/24 for supports at 24 inches on center.

## 2.4 STRUCTURAL-USE PANELS

- A. Comply with APA E30.
- B. Bearing the mark of a recognized association or independent agency that maintains continuing control over quality of panel which identifies compliance by end use, Span Rating, and exposure durability classification.

## 2.5 ENGINEERED LUMBER

- A. Parallel Strand Lumber (PSL)
  1. Size and shape as indicated on Drawings.
  2. Grade: 2.0E for Beams and 1.8E for Columns.
- B. Laminated Veneer Lumber (LVL)
  1. Size and shape as indicated on Drawings.
  2. Grade: 2.0E; minimum Flexural Stress = 2,600 psi

## 2.5 ROUGH HARDWARE AND ADHESIVES

- A. Anchor Bolts:
  1. ASME B18.2.1 and ASME B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.
  2. Extend at least 203 mm (8 inches) into masonry or concrete with ends bent 50 mm (2 inches).
- B. Miscellaneous Bolts: Expansion Bolts: C1D A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Provide 13 mm (1/2 inch) bolt unless shown otherwise.
- C. Washers
  1. ASTM F844.
  2. Provide zinc or cadmium coated steel or cast iron for washers exposed to weather.
- D. Screws
  1. Wood to Wood: ASME B18.6.1 or ASTM C1002.



2. Wood to Steel: ASTM C954, or ASTM C1002.
3. Mezzanine Flooring: use epoxy coated Torx drive screws at 12" o.c.

E. Nails

1. Size and type best suited for purpose unless noted otherwise. Provide aluminum-alloy nails, plated nails, or zinc-coated nails, for nailing wood work exposed to weather and on roof blocking.
  - a. Storage Bin Wood Slat Siding: utilize hot dipped galvanized spiral pole barn nails.
2. ASTM F1667
  - a. Common: Type I, Style 10.
  - b. Concrete: Type I, Style 11.
  - c. Barbed: Type I, Style 26.
  - d. Underlayment: Type I, Style 25.
  - e. Masonry: Type I, Style 27.
  - f. Provide special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 32 mm (1-1/4 inches) long, 8d and deformed or annular ring shank.

F. Framing and Timber Connectors

1. Fabricate of ASTM A653/A653M, Grade A; steel sheet not less than 1.3 mm (0.052 inch) thick unless specified otherwise. Apply standard plating to steel timber connectors after punching, forming and assembly of parts.
2. Framing Angles: Angle designed with bendable legs to provide three (3) way anchors.
3. Straps:
  - a. Designed to provide wind and seismic ties with sizes as shown or specified.
  - b. Strap ties not less than 32 mm (1-1/4 inches) wide.
  - c. Punched for fastener.
5. Joist Hangers
  - a. Fabricated of 1.6 mm (0.063 inch) minimum thick sheet, U design unless shown otherwise.
  - b. Heavy duty hangers fabricated of minimum 2.7 mm (0.108 inch) thick sheet, U design with bent top flange to lap over beam.
6. Timber Connectors: Fabricated of steel to shapes indicated on contract drawings.
7. Joist Ties: Mild steel flats, 5 mm by 32 mm (3/16 inch by 1-1/4 inch) size with ends bent about 30 degrees from horizontal, and extending at least 406 mm (16 inches) onto framing. Punch each end for three (3) spikes.
8. Wall Anchors for Joists and Rafters
  - a. Mild steel strap, 5 mm by 32 mm (3/16 inch by 1-1/4 inch) with wall ends bent 50 mm (2 inches), or provide 9 mm by 130 mm (3/8 inch by 5 inch) pin through strap end built into masonry.
  - b. Strap long enough to extend onto three joists or rafters, and punched for spiking at each bearing.
  - c. Strap not less than 101 mm (4 inches) embedded end.
9. Joint Plates

- a. Steel plate punched for nails.
- b. Steel plates formed with teeth or prongs for mechanically clamping plates to wood.
- c. Size for axial eccentricity, and fastener loads.

G. Adhesives

1. For field-gluing plywood to lumber framing floor or roof systems: ASTM D3498.
2. For structural laminated Wood: ASTM D2559.

## PART 3 – EXECUTION

### 3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS

A. Conform to applicable requirements of the following:

1. AFPA NDS for timber connectors.
2. AITC A190.1 Timber Construction Manual for heavy timber construction.
3. AFPA WCD1 for nailing and framing unless specified otherwise.
4. APA for installation of plywood or structural use panels.
5. TPI for metal plate connected wood trusses.

B. Fasteners

1. Nails.
  - a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA WCD1 where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.
  - b. Use special nails with framing connectors.
  - c. For sheathing and subflooring, select length of nails sufficient to extend 25 mm (1 inch) into supports.
  - d. Use 8d or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
  - e. Use 16d or larger nails for nailing through 50 mm (2 inch) thick lumber.
  - f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.
  - g. Nailing Schedule; Using Common Nails:
    - 1) Joist bearing on sill or girder, toe nail three (3) 8d nails or framing anchor.
    - 2) Bridging to joist, toe nail each end two (2) 8d nails.
    - 3) Ledger strip to beam or girder three (3) 16d nails under each joint.
    - 4) Subflooring or Sheathing:
      - a) 152 mm (6 inch) wide or less to each joist face nail two (2) 8d nails.
      - b) Subflooring, more than 152 mm (6 inches) wide, to each stud or joint, face nail three (3) 8d nails.
      - c) Plywood or structural use panel to each stud or joist face nail 8d, at supported edges 152 mm (6 inches) on center and at intermediate

supports 254 mm (10 inches) on center. When gluing plywood to joint framing increase nail spacing to 305 mm (12 inches) at supported edges and 508 mm (20 inches) o.c. at intermediate supports.

- 5) Sole plate to joist or blocking, through sub floor face nail 20d nails, 406 mm (16 inches) on center.
- 6) Top plate to stud, end nail two (2) 16d nails.
- 7) Stud to sole plate, toe nail or framing anchor. Four (4) 8d nails.
- 8) Doubled studs, face nail 16d at 610 mm (24 inches) on center.
- 9) Built-up corner studs 16d at 610 mm (24 inches) (24 inches) on center.
- 10) Doubled top plates, face nails 16d at 406 mm (16 inches) on center.
- 11) Top plates, laps, and intersections, face nail two (2) 16d.
- 12) Continuous header, two pieces 16d at 406 mm (16 inches) on center along each edge.
- 13) Ceiling joists to plate, toenail three (3) 8d or framing anchor.
- 14) Continuous header to stud, four (4) 16d.
- 15) Ceiling joists, laps over partitions, face nail three (3) 16d or framing anchor.
- 16) Ceiling joists, to parallel rafters, face nail three (3) 16d.
- 17) Rafter to plate, toe nail three (3) 8d or framing anchor. Brace 25 mm (1 inch) thick board to each stud and plate, face nail three (3) 8d.
- 18) Built-up girders and beams 20d at 812 mm (32 inches) on center along each edge.

## 2. Bolts

- a. Fit bolt heads and nuts bearing on wood with washers.
- b. Countersink bolt heads flush with the surface of nailers.
- c. Embed in concrete and solid masonry or provide expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
- d. Provide toggle bolts to hollow masonry or sheet metal.
- e. Provide bolts to steel over 2.84 mm (0.112 inch, 11 gage) in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 610 mm (24 inch) intervals between end bolts. Provide clips to beam flanges.

## 3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.

- a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
- b. ASTM C954 for steel over 0.84 mm (0.033 inch) thick.

## 4. Power actuated drive pins may be provided where practical to anchor to solid masonry, concrete, or steel.

## 5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Provide metal plugs, inserts or similar fastening.

## 6. Screws to Join Wood

- a. Where shown or option to nails.
- b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
- c. Spaced same as nails.

## 7. Installation of Timber Connectors

- a. Conform to applicable requirements of the AFPA NDS.
  - b. Fit wood to connectors and drill holes for fasteners so wood is not split.
- C. Set sills or plates level in full bed of mortar on masonry or concrete walls.
1. Space anchor bolts 1219 mm (4 feet) on centers between ends and within 152 mm (6 inches) of end. Stagger bolts from side to side on plates over 178 mm (7 inches) in width.
  2. Provide shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
  3. Closely fit, and set to required lines.
- D. Cut notch, or bore in accordance with AFPA WCD1 passage of ducts wires, bolts, pipes, conduits and to accommodate other work. Repair or replace miscut, misfit or damaged work.
- E. Blocking Nailers, and Furring:
1. Install furring, blocking, nailers, and grounds where shown.
  2. Provide longest lengths practicable.
  3. Provide fire retardant treated wood blocking where shown at openings and where shown or specified.
  4. Layers of Blocking or Plates:
    - a. Stagger end joints between upper and lower pieces.
    - b. Nail at ends and not over 610 mm (24 inches) between ends.
    - c. Stagger nails from side to side of wood member over 127 mm (5 inches) in width.
- F. Ceiling Framing:
1. Set with crown edge up.
  3. Bear on not less than 101 mm (4 inches) on concrete and masonry, and 38 mm (1-1/2 inches) on wood and metal unless shown otherwise.
  4. Support joist, trimmer joists, headers, and beams framing into carrying members at same relative levels on joist hangers unless shown otherwise.
  5. Lap and spike wood joists together at bearing, or butt end-to-end with scab ties at joint and spike to plates. Scab tie lengths not less than 203 mm (8 inches) lap on joist ends. Install wood I beam joists as indicated in contract documents.
  6. Frame openings with headers and trimmer joist. Double headers carrying more than two tail joists and trimmer joists supporting headers carrying more than one tail joist unless otherwise indicated in contract documents.
  7. Drive nails through headers into joists using two (2) nails for 50 mm by 152 mm (2 inch by 6 inch); three (3) nails for 50 mm by 203 mm (2 inch by 8 inch) and four (4) nails for 50 mm by 254 mm (2 inch by 10 inch) and over in size.
  8. Install nearest joist to double headers and spike joist to both header members before trimmer joist is installed and secured together.
  9. Doubled joists under partitions parallel with floor joists.
  10. Where joists run perpendicular to masonry or concrete, anchor every third joist to masonry or concrete with one (1) metal wall anchor. Securely spike anchors with three (3) nails to side of joist near its bottom.

11. Anchor joists running parallel with masonry or concrete walls to walls with steel flats spaced not over 1828 mm (6 feet) apart. Extend steel flats over at least three (3) joists and into masonry 101 mm (4 inches) with ends turned 50 mm (2 inches); bolt to concrete. Set top of flats flush with top of joists, and securely nail steel flats to each joist.
12. Hook ties at steel framing over top flange of steel members.
13. Nonbearing partitions running parallel with ceiling joists, install solid 2 inch) thick bridging same depth as ceiling joists cut to fit snug between joists for securing top plate of partitions. Securely spike bridging to joists. Space 1219 mm (4 feet) on center.

J. Partition and Wall Framing:

1. Provide 2 inch by 4 inch studs spaced 16 inches on centers; unless otherwise indicated on contract documents.
2. Install double studs at openings and triple studs at corners.
3. Installation of sole plate:
  - a. Anchor plates of walls or partitions resting on concrete floors in place with expansion bolts, one (1) near ends of piece and at intermediate intervals of not more than 4 feet or with power actuated drive pins with threaded ends of suitable type and size, spaced 2 feet on center unless shown otherwise.
  - b. Nail plates to wood framing through subfloor as specified in nailing schedule.
4. Headers or Lintels:
  - a. Make headers for openings of two (2) pieces of 2 inch thick lumber of size shown with plywood filler to finish flush with face of studs or solid lumber of equivalent size.
  - b. Support ends of headers on top of stud cut for height of opening. Spike cut stud to adjacent stud. Spike adjacent stud to header.
5. Provide double top plates, with members lapped at least 2-feet spiked together.
6. Install intermediate cut studs over headers and under sills to maintain uniformity of stud spacing.
7. Provide single sill plates at bottom of opening unless otherwise indicated in contract documents. Toe nail to end stud, face nail to intermediate studs.
8. Install 2 inch blocking for firestopping so that maximum dimension of any concealed space is not over 8 feet in accordance with AFPA WCD1.
9. Install corner bracing when plywood or structured use panel sheathing is not used.
  - a. Let corner bracing into exterior surfaces of studs at an angle of approximately 45 degrees, extended completely over walls plates, and secured at bearing with two (2) nails.
  - b. Provide 1 inch by 4 inch corner bracing.

K. Rough Bucks:

1. Install rough wood bucks at opening in masonry or concrete where wood frames or trim occur.
2. Brace and maintain bucks plumb and true until masonry has been built around them or concrete cast in place.

3. Cut rough bucks from 2 inch thick stock, of same width as partitions in which they occur and of width shown in exterior walls.
4. Extend bucks full height of openings and across head of openings; fasten securely with anchors specified.

L. Subflooring

1. Subflooring to be plywood.
2. Apply plywood subflooring with face grain or long dimension at right angles to the supports, with edges 1/4 inch apart at side joints, and 1/8 inch apart at end joints.

END OF SECTION 061000

## **SECTION 061053 – MISCELLANEOUS ROUGH CARPENTRY**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Wood blocking and nailers.
  - 2. Plywood backing panels.
  - 3. Wood treatment.
  - 4. Project identification sign (temporary).

#### **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. NLGA: National Lumber Grades Authority.
  - 2. SPIB: The Southern Pine Inspection Bureau.

#### **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.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- D. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated wood.
  - 2. Fire-retardant-treated wood.
  - 3. Power-driven fasteners.
  - 4. Powder-actuated fasteners.

#### **1.5 QUALITY ASSURANCE**

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

## 1.6 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 - PRODUCTS

### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS20 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.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
  - 3. All Preservative Treated Lumber to be 0.6 lb./CF. Provide a signed certification by the wood treatment facility that the wood meets this requirement.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
  - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.



- D. Application: Treat items indicated on Drawings.

## 2.3 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. Cants.
  4. Furring.
  5. Grounds.
- B. For items of dimension lumber size, provide Standard, Stud, or No.3 grade lumber of any species.

## 2.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS1, Exterior, C-D plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

## 2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
  2. Provide stainless steel type fasteners at all wood preservative treated materials including all roofing and exterior blocking.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: NESNER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, ClassFe/Zn5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group1 or 2.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated.
- F. 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.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  1. NESNER-272 for power-driven fasteners.
  2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preserved-treated lumber is installed adjacent to metal decking or metal studs/framing, install continuous flexible flashing separator between wood and metal.

### 3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Gypsum Board or Plaster Lath: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.

### 3.4 PROJECT IDENTIFICATION SIGNS

- A. Sign shall be by GC at location directed by the Township.
  - 1. Provide three full height 4-inch by 6-inch posts buried 3-1/2 feet in the ground with tamped earth around posts.
  - 2. Provide 4 ft. by 8 ft. sheets of 3/4-inch MDO exterior grade plywood for signage. Glue plywood edges together using biscuit joiners 18-inches o.c. with 100 percent construction adhesive coverage.
  - 3. Provide pine trim (two step) mitered at corners.
  - 4. All wood shall be pressure treated.
  - 5. Paint entire sign with primer and two coats of exterior gloss acrylic paint.
  - 6. Remove sign from site at completion of project and fill posts holes.

**END OF SECTION 061053**

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## **SECTION 061760 - METAL-PLATE-CONNECTED WOOD TRUSSES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Wood roof trusses.
  - 2. Wood truss bracing.
  - 3. Metal truss accessories.
- B. Related Sections include the following:
  - 1. Division 6 Section 061600 - "Sheathing" for roof sheathing and subflooring.

#### **1.3 DEFINITIONS**

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.
- B. TPI: Truss Plate Institute, Inc.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
  - 2. NLGA: National Lumber Grades Authority.
  - 3. SPIB: The Southern Pine Inspection Bureau.
  - 4. WCLIB: West Coast Lumber Inspection Bureau.
  - 5. WWPA: Western Wood Products Association.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated.
2. Maximum Deflection Under Design Loads:
  - a. Roof Trusses: Vertical deflection of **1/240** of span.

## 1.5 SUBMITTALS

- A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.
  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. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.
  3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer. Show fabrication and installation details for trusses.
  1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
  2. Indicate sizes, stress grades, and species of lumber.
  3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
  4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
  5. Show splice details and bearing details.
  6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

## 1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
  1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.

2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
  - B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
  - C. Source Limitations for Connector Plates: Obtain metal connector plates from a single manufacturer.
  - D. Comply with applicable requirements and recommendations of the following publications:
    1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
    2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
    3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
  - E. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."
  - F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Preconstruction Meetings" and "Pre-Installation Meetings."
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
    1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
    2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
    3. Provide for air circulation around stacks and under coverings.
  - B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.
- 1.8 COORDINATION
- A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

## PART 2 - PRODUCTS

### 2.1 DIMENSION LUMBER

- 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. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
  - 3. Provide dressed lumber, S4S.
  - 4. Provide dry lumber with **19** percent maximum moisture content at time of dressing.
- B. Grade and Species: For truss chord and web members, provide dimension lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."
- C. Lumber for all truss components for Building C roof shall be preservative treated.
- D. Permanent Bracing: Provide permanent wood truss bracing as designed and required by the truss manufacturer.

### 2.2 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1; all truss connector plates shall be hot-dipped galvanized.
- B. Hot-Dip Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

### 2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture. All fasteners for use on Building C roof construction shall be hot-dipped galvanized or stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.



- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

## 2.4 METAL TRUSS ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:
  - 1. Simpson Strong-Tie Co., Inc.
  - 2. Southeastern Metals Manufacturing Co., Inc.
  - 3. USP Structural Connectors.
- D. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- E. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
- F. Truss Tie-Downs: As indicated on Drawings.

- G. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick. Clip is fastened to truss through slotted holes to allow for truss deflection.
- H. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches (38 mm) wide by 1 inch (25 mm) deep by 0.040 inch (1.0 mm) thick, made to fit between 2 adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

## 2.5 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

- G. Anchor trusses securely at bearing points; use metal truss tie-downs as applicable. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
  - 1. Anchor trusses to girder trusses as indicated.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
  - 1. Install bracing as indicated on approved submittal drawings.
  - 2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not cut or remove truss members.
- L. Replace wood trusses that are damaged or do not meet requirements; do not alter trussed in the field.

### 3.2 REPAIRS AND PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- C. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- D. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.
  - 1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION 061760

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## **SECTION 066000 - PVC WALL PANELS**

### **PART 1 GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SECTION INCLUDES:**

- A. Plastic wall liner panels.

#### **1.3 RELATED SECTIONS:**

- A. Division 06: Rough and Finish Carpentry.
- B. Division 09: Special Wall Surfacing

#### **1.4 REFERENCES**

- A. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. S102.2-18 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies
- C. ASTM D4226 -Standard Test Method for Impact Resistance
- D. ASTM G21-Standard Test Method Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

#### **1.5 SUBMITTALS**

- A. Submit under provisions of Division 01 "Submittals".
- B. Product Data: Manufacturer's product information and data sheets for each product specified in this section, including:
  - 1. Preparation instructions and recommendations.
  - 2. Installation means and methods.
  - 3. Recommendations and requirements for proper storage and handling.
- C. Shop Drawings: Include layout dimensions, profiles, product components, anchorage details, track mounting and support, and interface with adjoining construction.
  - 1. Submit Manufacturer's approved shop drawings detailing the section and elevation views of each product to be installed.

2. Coordinate with locations listed on Contract Drawings.
- D. Verification Samples: Provide two samples of specified product, representing actual color, finish, and patterns.
- E. Informational Submittals:
  1. Installer qualifications.
  2. Product test reports.
  3. Sample warranties.
- F. Closeout Submittals:
  1. Maintenance data for installed system.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Primary products shall be manufactured and supplied by a single manufacturer.
- B. Installer Qualifications: Products shall be installed by a single installer with demonstrated experience in installing products of the same type and scope as specified.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in accordance with the manufacturer's instructions and recommendations and industry standards.
- B. Store all materials in the manufacturer's original packaging until 24 hours prior to installation.
- C. Store materials flat, and in a clean, dry area indoors in accordance with manufacturer's instructions.
- D. Store materials in the location where they will be installed for no less than 24 hours prior to installation to minimize post-installation expansion or contraction and ensure the best possible installation. Loosen or remove any packaging material that may restrain the product while acclimatizing.

#### 1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Panels should be installed in an environment where panels have been acclimatized to a temperature between 50 degrees F and 68 degrees F (10 degrees C and 20 degrees C) for at least 24 hours before installation.

- B. Prior to fabrication, verify that dimensions are consistent with those found in the construction drawings. Where discrepancies exist, confirm the proper dimensions with the Architect before proceeding with work.
- C. Cold Temperatures – Do NOT install panels at temperature at or below 32 degrees F (0 degrees C).

## 1.9 WARRANTY

- A. Warranty: Manufacturer agrees to replace or refund the purchase price of nonconforming PVC panels and trim defective in material or workmanship within the specified warranty period of twenty (20) years or lifetime upon registration.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design Product: Drawings and specifications are based on the following product. Subject to compliance with requirements, provide the following or equivalent product from acceptable manufacturer.
- B. Trusscore Inc.
  - 1. Address: 140 Minto Road Palmerston, ON N0G2P0
  - 2. Phone: +1 (888) 418-4679
  - 3. Fax: (866) 457-9859
  - 4. Website: <https://trusscore.com>
  - 5. Email: [hello@trusscore.com](mailto:hello@trusscore.com)

### 2.2 PERFORMANCE REQUIREMENTS

- A. Physical Performance:
  - 1. Impact Resistance: Minimum 2.08 In-l/mil in according to ASTM D4226.
  - 2. Coefficient of Thermal Expansion: Maximum  $5.7 \times 10^{-5}$  in/in/°F; according to ASTM D696.
  - 3. Material Density: Density rating of 1.46 according to ASTM D792.
  - 4. Tensile Strength: Minimum of 6575 psi rating according to ASTM D638.
- B. Surface-Burning Characteristics: Meet the following values according to ASTM E84 and CAN/ULC-S102:
  - 1. ASTM E84 Class A Flame-Spread Index: 15.
  - 2. CAN/ULC-S102 Class A Flame-Spread Index: 10.
  - 3. ASTM E84 Smoke Developed Index: 450.
  - 4. CAN/ULC-S102Smoke Developed Index: 380.
- C. Environmental Performance:

1. Food Processing Facilities: CFIA approved and compliant with FDA and USDA guidelines.
2. Fungus Resistance: Pass; Growth rating of 0 according to ASTM G21 and ISO 846:2019. Boards do not contain cellulosic material.

D. Waterproof; nonporous.

E. Corrosion Proof.

## 2.3 PVC WALL PANELS

A. Basis-of-Design Product: Trusscore Wall&CeilingBoard, by Trusscore Inc.

1. General: Provide Tongue-and-groove, Rib-reinforced PVC liner panel with nailing fins.
2. Description:
  - a. Material: PVC;
  - b. Outside Surface: Flat.
  - c. Width: 16-Inches (406-mm).
  - d. Available Lengths: 8-Feet, 10-Feet, 12-Feet, 14-Feet, 16-Feet, 20-Feet.
  - e. Thickness: 1/2-Inch (13-mm).
  - f. Weight: 0.8 Pounds per square foot.
  - g. Color: White.

## 2.4 ACCESSORIES

A. Basis-of-Design Product: Trusscore PVC Trim, by Trusscore Inc.

1. Description: Base Trim, F Trim, H Channel Snap-in Kit, Inside Cove Corner, J Trim 1/2 inch, Outside Corner, and 45 Degree H Channel.
  - a. Material: PVC;
  - b. Color: White

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.2 INSTALLATION

- A. Wall Panels: Install PVC panels in accordance with manufacturer's instructions at locations indicated on the Drawings.
  1. Ensure panels are plumb, level, square, and in proper alignment.



2. Anchor wall panels with construction adhesive and fasteners in accordance with manufacturer's instructions.

B. High Moisture Environment Installation:

1. Apply silicone sealant inside the grooved end of the panel prior to inserting the next panel.
2. Ensure that drainage pathways are created in trim pieces, in accordance with manufacturers written instructions.

C. Fasteners: Corrosion resistant No. 8 or No. 10 gauge screws with a flat-bottomed, low-profile head and a minimum head diameter of 3/8 Inch.

1. Fastening into Wood: Stainless Steel or Zinc coated, 1-1/4 Inch, No. 10 or No. 8 round washer or truss screws.
2. Fastening into Metal Studs: Self-tapping, stainless steel or zinc coated, 1-1/4 Inch, No. 10 or No. 8 round washer or truss screws.
3. Fastening into Masonry: Stainless steel, corrosion resistant, 3/16-inch x 1-1/4 Inch flathead concrete screws.
4. Install fasteners in pre-punched holes 16 inches to 24 inches (406mm - 610mm) on center into screw flange.
5. Ensure screw flange lays flat against surface, between screw head and substrate, not deformed around screw heads.
6. Do not recess screw heads into nailing fins.
7. Ensure fasteners are not exposed.
8. When applying over drywall, screws should be 1-3/4 Inch to 2 Inches long. If furring strips or strapping are part of your installation, screws should be 2-1/2 Inches.
9. For highly corrosive or moist environments, use stainless-steel screws.

D. Cutting Panels:

1. Field-cut panels as necessary in accordance with manufacturer's instructions.
2. Ensure cuts are straight, square, and do not damage panels.

### 3.3 CLEANING AND PROTECTION

A. Clean surfaces with a mild detergent or soap scum remover.

B. In cases when hand cleaning is not satisfactory, pressure washers may be used with mild soap and a sponge or soft cloth, provided the guidelines below are followed:

1. Power washing nozzle should be at least 4-6 ft away from the wall.
2. Use a small-to mid-size power washer with less than 3,000 psi.
3. Use a wide spray nozzle angle (40° or greater is preferred) to distribute the water pressure across the wall.

C. Multi-purpose cleaners may be used, provided they are PVC compatible. Spot test material in an inconspicuous location prior to cleaning.

- D. Provide final protection and maintain conditions that ensure that products are without damage or deterioration at time of Substantial Completion.

**END OF SECTION 066000**

## **SECTION 066510 - SOLID SURFACE FABRICATIONS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The Drawings 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 horizontal and trim solid surface product types:
  - 1. Countertops.
  - 2. Window Stools.
  - 3. Shower surrounds.
- B. Related Sections include the following:
  - 1. Division 05 Section "Metal Fabrications" for Blocking.
  - 2. Division 06 Section "Rough Carpentry" for Blocking.
  - 3. Division 22 Section "Plumbing Fixtures."

#### **1.3 DEFINITION**

- A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

#### **1.4 SUBMITTALS**

- A. Product data:
  - 1. For each type of product indicated.
  - 2. Product data for the following:
    - a. Solid surface counter tops and accessories.
- B. Shop drawings:
  - 1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
    - a. Show full-size details, edge details, thermoforming requirements, attachments, etc.

- b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
  - c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.
- C. Samples:
  - 1. For each type of product indicated.
    - a. Submit minimum 6-inch by 6-inch sample in specified gloss.
    - b. Cut sample and seam together for representation of inconspicuous seam.
    - c. Indicate full range of color and pattern variation.
- D. Product data:
  - 1. Indicate product description, fabrication information and compliance with specified performance requirements.
- E. Fabricator/installer qualifications:
  - 1. Provide copy of certification number.
- F. Manufacturer certificates:
  - 1. Signed by manufacturers certifying that they comply with requirements.
- G. Maintenance data:
  - 1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
    - a. Maintenance kit for finishes shall be submitted.
  - 2. Include in project closeout documents.

## 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
- B. Fabricator/installer qualifications:
  - 1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
- C. Applicable standards:
  - 1. Standards of the following, as referenced herein:

- a. American National Standards Institute (ANSI)
  - b. American Society for Testing and Materials (ASTM)
  - c. National Electrical Manufacturers Association (NEMA)
  - d. NSF International
2. Fire test response characteristics:
- a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
    - 1) Flame Spread Index: 25 or less.
    - 2) Smoke Developed Index: 450 or less.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation.
- B. Store components indoors prior to installation.
- C. Handle materials to prevent damage to finished surfaces.
  1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

## 1.7 WARRANTY

- A. Provide manufacturer's warranty against defects in materials.
  1. Warranty shall provide material and labor to repair or replace defective materials.
  2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
- B. Manufacturer's warranty period:
  1. One year from date of substantial completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

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

- a. Corian® surfaces from the DuPont company (basis of design) or approved equal.
- b. Wilsonart.
- c. Formica.

## 2.2 MATERIALS

- A. Solid polymer components
  1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
  2. Superficial damage to a depth of 0.010 inch shall be repairable by sanding and/or polishing.
- B. Thickness:
  1. 1/2 inch
- C. Edge treatment:
  1. One inch (1") thick full bullnose
- D. Inlays:
  1. Fabricate using manufacturer's approved method.
  2. Rout 1/8" deep max. groove for inlay to pattern indicated on designer's drawings.
  3. Fill groove using methods approved by manufacturer, avoiding air bubbles or voids.
  4. Overfill inlay area.
  5. Allow area to fully cure.
    - a. Do not overheat inlay while sanding.
  6. Finish and touch up to uniform appearance.

## 2.3 ACCESSORIES

- A. Joint adhesive:
  1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.
- B. Sealant:
  1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.
- C. Conductive tape:

1. Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.
- D. Insulating felt tape:
  1. Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.
- E. Fasteners and accessories:
  1. Stainless steel fasteners

## 2.4 FACTORY FABRICATION

- A. Shop assembly
  1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
  2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
    - a. Reinforce with strip of solid polymer material, 2" wide.
  3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
  4. Rout and finish component edges with clean, sharp returns.
    - a. Rout cutouts, radii and contours to template.
    - b. Smooth edges.
    - c. Repair or reject defective and inaccurate work.

## 2.5 FINISHES

- A. Select from the manufacturer's standard color chart.
  1. Color:
    - a. To be selected by Architect from manufacturer's standard color chart.
- B. Finish:
  1. Provide surfaces with a uniform finish.
    - a. Matte; gloss range of 5–20.
      - 1) To be selected by Architect from manufacturer's standard range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
  - 1. Provide product in the largest pieces available.
  - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
    - a. Exposed joints/seams shall not be allowed.
  - 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
  - 4. Cut and finish component edges with clean, sharp returns.
  - 5. Rout radii and contours to template.
  - 6. Anchor securely to base cabinets or other supports.
  - 7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
  - 8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
  - 9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.

### 3.3 REPAIR

- A. Repair or replace damaged work which cannot be repaired to Architect's satisfaction.

### 3.4 CLEANING AND PROTECTION

- A. Keep components clean during installation.
- B. Remove adhesives, sealants and other stains.

END OF SECTION 066510



## **SECTION 071113 - BITUMINOUS DAMPPROOFING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general 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. Cold-applied, emulsified-asphalt dampproofing applied to the following surfaces:
  - a. Exterior, below grade surfaces.
  - b. Exterior face of inner wythe block back up.

- B. Related Sections

- 1. Section 071326 "Self-Adhering Sheet Waterproofing".
- 2. Section 072500 "Moisture Barriers".

#### **1.3 ACTION SUBMITTALS**

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

#### **1.4 FIELD CONDITIONS**

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS, GENERAL**

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide molded-sheet drainage panels and auxiliary materials recommended in writing by manufacturer of primary materials.

## 2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Henry Company.
  - 2. Karnak Corporation.
  - 3. Meadows, W. R., Inc.
- B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

## 2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- D. Patching Compound: Type recommended in writing by dampproofing manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
- C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

### 3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
  - 1. Apply dampproofing to provide continuous plane of protection.
  - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
  - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
  - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
  - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
  - 2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.

### 3.4 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071113

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## **SECTION 072100 - THERMAL INSULATION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Foam-plastic board insulation.
  - 2. Rigid mineral wool board insulation.
  - 3. Batt insulation.
- B. Related Sections include the following:
  - 1. Section 092900 "Gypsum Board" for installation in metal-framed assemblies of insulation specified by referencing this section.

#### **1.3 ACTION SUBMITTALS**

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

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

#### **1.5 QUALITY ASSURANCE**

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. DiversiFoam Products.
    - b. Dow Chemical Company.
    - c. Owens Corning.
    - d. Pactiv Building Products.
    - e. T. Clear Corporation, a subsidiary of Fin Pan Inc.
  - 2. Type VI, 40 psi. at perimeter foundation walls.
  - 3. Type V, 100 psi. under slab.

### 2.2 BATT INSULATION

- A. Semi-Rigid batt insulation: ASTM C167, ASTM C518, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  - 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: Rockwool COMFORT BATT or equivalent product from: Owens Corning, Johns Manville.
  - 2. Refer to Drawings for insulation thicknesses and thermal resistance rating.

## 2.3 INSULATION FASTENERS

- A. Type recommended by insulation manufacturer for insulation types, and applications specified.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

### 3.3 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive applied according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

### 3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Semi-rigid batt insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

### 3.5 INSTALLATION OF INSULATION FOR CONCRETE/CMU (NON-CAVITY) SUBSTRATES

- A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
  - 1. Fasten z-clip to concrete or cmu substrates where exterior cladding is cement board, metal panel or as noted in drawings per manufacturer's written instructions. Space clips according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.

### 3.6 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100



## **SECTION 072500 - MOISTURE BARRIERS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Vapor retarders.
  - 2. Flexible flashing.
  - 3. Liquid-applied flashing membrane.

#### **1.3 RELATED SECTIONS**

- A. Section 079200 – Joint Sealants.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. For panels with integral water resistive barrier, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

### **PART 2 - PRODUCTS**

#### **2.1 VAPOR RETARDERS**

- A. Location: see wall sections.

1. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.
2. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder

## 2.2 MISCELLANEOUS MATERIALS

- A. Self-Adhering Seam and Flashing Tape: Pressure-sensitive, self-adhering, cold-applied, proprietary seam tape consisting of polyolefin film with acrylic adhesive.
  1. Basis-of-Design Product: Subject to compliance with requirements provide Huber Engineered Woods; ZIP System Tape.
  2. Thickness: 0.012 inch (0.3 mm).
  3. Width: 6 inch (152.4 mm).
  4. Code Compliance: Comply with requirements of authorities having jurisdiction and ICC Evaluation Service, Inc. "AC148 - Acceptance Criteria for Flexible Flashing Materials."
  5. International Code Council (ICC), ICC-ES2227 (ZIP System Tape).
  6. American Architectural Manufacturer's Association; AAMA 711.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
  1. Before installing vapor retarder, apply sealant, (type as recommended by vapor retarder manufacturer), to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
  2. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

### 3.2 FLASHING INSTALLATION

#### A. Through Wall Flashing

1. Prime surfaces to be covered in one working day with applicable adhesive.
2. Remove release paper prior to application.
3. Apply through wall flashing at base of masonry walls as indicated in drawings.
4. Recess all through wall flashing  $\frac{1}{2}$ " from face of masonry.
5. Apply a bead of pointing mastic if through wall flashing is not embedded into masonry.

END OF SECTION 072500

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## **SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Adhered thermoplastic polyolefin (TPO) roofing.
  - 2. Vapor retarder.
- B. Related Sections include the following:
  - 1. Division 6 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, cants, and blocking; and wood-based, structural-use roof deck panels.
  - 2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings and counterflashings.
  - 3. Division 7 Section "Joint Sealants."

#### **1.3 DEFINITIONS**

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

#### **1.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
  - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  - 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.

5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
  1. Base flashings and membrane terminations.
  2. Tapered insulation, including slopes.
  3. Roof plan showing orientation of steel roof deck and orientation of roofing, fastening spacings, and patterns for mechanically fastened roofing.
  4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- C. Samples for Verification: For the following products:
  1. Sheet roofing, of color required.
  2. Roof paver, full sized, for Alternate #1 Green Roof System.
  3. Walkway pads or rolls, of color required.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
  1. Submit evidence of compliance with performance requirements.
- C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Field quality-control reports.
- F. Sample Warranties: For manufacturer's special warranties.

#### 1.7 CLOSEOUT SUBMITTALS

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

## 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is FM Global approved for roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

## 1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

## 1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
  - 1. Special warranty includes roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, roof pavers and other components of roofing system.

2. Warranty Period: 20 years from date of Substantial Completion.

- B. Applicator/Roofing Contractor Warranty: Applicator shall supply Owner with a separate workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with the Contract Documents, Applicator shall repair that defect at no cost to the Owner. Applicator's warranty obligation shall run directly to Owner.

1. Warranty Period: 2 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Carlisle SynTec Incorporated.
  2. Custom Seal Roofing.
  3. Firestone Building Products.
  4. Flex Roofing Systems.
  5. GAF Materials Corporation.
  6. Johns Manville.
- A. Source Limitations: Obtain components including roof insulation, fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
  2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:



1. Corner Uplift Pressure: As calculated according to ASCE/SEI 7 and applicable code.
  2. Perimeter Uplift Pressure: As calculated according to ASCE/SEI 7 and applicable code.
  3. Field-of-Roof Uplift Pressure: As calculated according to ASCE/SEI 7 and applicable code.
  4. Provide all additional nailers, attachment strips, ballast pavers or other accessories required to resist calculated uplift pressure.
- D. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A-90.
  2. Hail-Resistance Rating: MH.
- E. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- F. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- G. Energy Performance: Roofing system shall have an initial solar reflectance index of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- H. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- I. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

## 2.3 TPO ROOFING

- A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible fabric-backed TPO sheet.
1. Thickness: 60 mils, nominal.
  2. Exposed Face Color: White.

## 2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:

- a. Plastic Foam Adhesives: 50 g/L.
- b. Gypsum Board and Panel Adhesives: 50 g/L.
- c. Multipurpose Construction Adhesives: 70 g/L.
- d. Fiberglass Adhesives: 80 g/L.
- e. Single-Ply Roof Membrane Adhesives: 250 g/L.
- f. Single-Ply Roof Membrane Sealants: 450 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.
- j. Other Adhesives and Sealants: 250 g/L.

- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, of same color as TPO sheet.
- C. Bonding Adhesive: Manufacturer's standard.
- D. Slip Sheet: Manufacturer's standard, of thickness required for application.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
- G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.
- H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.
- I. Primers: Manufacturer's standard primers.

## 2.5 VAPOR RETARDER

- A. Polyethylene Film: ASTM D 4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.
  - 1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
  - 2. Adhesive: Manufacturer's standard lap adhesive, FM Global approved for vapor-retarder application.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
  - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
  - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Install insulation strips according to acoustical roof deck manufacturer's written instructions.

### 3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

### 3.4 VAPOR-RETARDER INSTALLATION

- A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively. Continuously seal side and end laps with tape.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

### 3.5 ADHERED ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

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

### 3.6 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

### 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

### 3.8 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

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## **SECTION 076200 - SHEET METAL FLASHING AND TRIM**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

1. Manufactured through-wall flashing.
2. Manufactured reglets.
3. Formed low-slope roof flashing and trim.
4. Formed wall flashing and trim.
5. Formed equipment support flashing.

- B. Related Sections include the following:

1. Section 042000, "Unit Masonry Assemblies" for installing through-wall flashing, reglets, and other sheet metal flashing and trim.
2. Section 061053, "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
3. Section 079000, "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

#### **1.3 COORDINATION**

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

#### **1.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
  1. Identify material, thickness, weight, and finish for each item and location in Project.
  2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
  3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
- C. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  1. Sheet Metal Flashing: 12 inches long. Include fasteners, cleats, clips, closures, and other attachments.
  2. Trim: 12 inches long. Include fasteners and other exposed accessories.
  3. Accessories: Full-size Sample.
- E. INFORMATIONAL SUBMITTALS
- F. Qualification Data: For fabricator.
- G. Product Certificates: For each type of coping and roof edge flashing that is SPRIES-1 tested and FM Approvals approved.
- H. Sample Warranty: For special warranty.

## 1.6 CLOSEOUT SUBMITTALS



- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

## 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.

## 1.8 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. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

## 1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
    - b. Chalking in excess of a No.8 rating when tested according to ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Fabricate and install copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet1-49:
  - 1. Wind Zone1: For velocity pressures of 10 to 20 lbf/sq. ft. perimeter uplift force, 60-lbf/sq. ft. corner uplift force, and 20-lbf/sq. ft. outward force.
  - 2. Wind Zone1: For velocity pressures of 21 to 30 lbf/sq. ft. perimeter uplift force, 90-lbf/sq. ft. corner uplift force, and 30-lbf/sq. ft. outward force.
  - 3. Wind Zone2: For velocity pressures of 31 to 45 lbf/sq. ft.: 90-lbf/sq. ft. perimeter uplift force, 120-lbf/sq. ft. corner uplift force, and 45-lbf/sq. ft. outward force.
- 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 (Range): 120 degF, ambient; 180 degF, material surfaces.

## 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM 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. Two-Coat Fluoropolymer: AAMA620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 2. Color: As selected by Architect from manufacturer's full range.
  - 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- C. Stainless-Steel Sheet: ASTM A666, Type304, dead soft, fully annealed; with smooth, flat surface.
  - 1. Finish: 2D (dull, cold rolled).

- D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A653/A653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.
1. Surface: Smooth, flat.
  2. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  3. Color: As selected by Architect from manufacturer's full range.
  4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

## 2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or 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.
  2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
  3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
  4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.
- C. Solder:
1. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
  2. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D1187.
- I. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

## 2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Through-Wall Ribbed Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond. Manufacture through-wall flashing with snaplock receiver on exterior face to receive counterflashing.
  - 1. Stainless Steel: 0.016 inch thick.
    - a. Products:
      - 1) Cheney Flashing Company, Inc.; Cheney Flashing (Dovetail).
      - 2) Cheney Flashing Company, Inc.; Cheney Flashing (Sawtooth).
      - 3) Keystone Flashing Company, Inc.; Keystone Three-Way Interlocking Thruwall Flashing.
      - 4) Metal-Fab Manufacturing, LLC.
- B. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.
  - 1. Manufacturers:
    - a. Cheney Flashing Company, Inc.
    - b. Fry Reglet Corporation.
    - c. Heckmann Building Products Inc.
    - d. Hickman, W. P. Company.
    - e. Keystone Flashing Company, Inc.

- f. Sandell Manufacturing Company, Inc.
- 2. Material: Aluminum, 0.024 inch thick.
- 3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
- 4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
- 5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
- 6. Accessories:
  - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
  - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
- 7. Finish: Mill.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 2. Obtain field measurements for accurate fit before shop fabrication.
  - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

2. Use lapped expansion joints only where indicated on Drawings.

- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet1-49 for application, but not less than thickness of metal being secured.
- F. Seams to be Soldered: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- G. Seams: 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 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.
  - 1. Coping Profile: As indicated on Drawings.
  - 2. Joint Style: Butt, with 12-inch- wide concealed backup plate.
  - 3. Fabricate copings from the following material:
    - a. Prefinished Aluminum: Minimum 0.050 inch thick.
- B. Base Flashing: Fabricate from the following material:
  - 1. Aluminum: 0.040 inch thick.
  - 2. Galvanized Steel: 0.0276 inch thick.
  - 3. Prepainted, Metallic-Coated Steel: 0.0276 inch thick.
- C. Counterflashing: Fabricate from the following material:
  - 1. Aluminum: 0.0320 inch thick.
  - 2. Galvanized Steel: 0.0217 inch thick.
- D. Roof-Penetration Flashing: Provide for all roof penetration locations. Fabricate from the following material:
  - 1. Galvanized Steel: 0.0276 inch thick.
  - 2. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch thick.

## 2.7 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot-long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high end dams. Fabricate from the following material:
  - 1. Stainless Steel: 0.0156 inch thick.
- B. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, 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 material:
  - 1. Aluminum: 0.0320 inch thick.

## 2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following material:
  - 1. Stainless Steel: 0.0187 inch thick.

## 2.9 FINISHES

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of 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. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  5. Torch cutting of sheet metal flashing and trim is not permitted.
  6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
  1. Coat concealed side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection.
  1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fasteners of sizes that will penetrate substrate 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 with elastomeric sealant as required for watertight construction.
  - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70degF, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40degF.
  - 2. Prepare joints and apply sealants to comply with requirements in Division7 Section "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Prein edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.
  - 1. Do not use torches for soldering.
  - 2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
  - 3. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

### 3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet1-49 for FM Approvals' listing for required windstorm classification.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

### 3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of manufactured or formed through-wall flashing.
- C. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

### 3.5 MISCELLANEOUS FLASHING INSTALLATION

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

### 3.6 ERECTION TOLERANCES

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

### 3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

## **SECTION 077100 - ROOF SPECIALTIES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:

- 1. Copings.
- 2. Roof-edge specialties.
- 3. Roof-edge drainage systems.
- 4. Reglets and counterflashings.

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

- 1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.
- 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
- 3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

#### **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. Shop Drawings: For roof specialties.

- 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
- 2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.

3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
  4. Detail termination points and assemblies, including fixed points.
  5. Include details of special conditions.
- C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- D. Samples for Verification:
1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
  2. Include copings, roof-edge specialties, roof-edge drainage systems, and reglets and counterflashings made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

#### 1.4 INFORMATIONAL SUBMITTALS

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

#### 1.5 CLOSEOUT SUBMITTALS

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

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are SPRI ES-1 tested to specified design pressure.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical roof edge, approximately 10 feet long, including supporting construction, seams, attachments, underlayment, and accessories.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

## 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.

## 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.9 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer'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 D2244.
    - b. Chalking in excess of a No.8 rating when tested according to ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

- B. SPRI Wind Design Standard: Manufacture and install roof-edge flashings tested according to SPRIES-1 and capable of resisting the following design pressures:
  - 1. Design Pressure: As indicated on Architectural and Structural Drawings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 COPINGS

- A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, end termination units, and concealed splice plates with same finish as coping caps..
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Architectural Products Company.
    - b. ATAS International, Inc.
    - c. Castle Metal Products.
    - d. Hickman Company, W. P.
    - e. Johns Manville.
    - f. Metal-Era, Inc.
    - g. Metal-Fab Manufacturing, LLC.
    - h. Petersen Aluminum Corporation.
  - 2. Formed Aluminum Sheet Coping Caps: Aluminum sheet, thickness as required to meet performance requirements.
    - a. Surface: Smooth, flat finish.
    - b. Finish: Two-coat fluoropolymer.
    - c. Color: As selected by Architect from manufacturer's full range.
  - 3. Corners: Factory mitered and continuously welded.
  - 4. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
    - a. Snap-on-Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.

## 2.3 ROOF-EDGE SPECIALTIES

- A. Canted Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat. Provide matching corner units.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Architectural Products Company.
    - b. ATAS International, Inc.
    - c. Castle Metal Products.
    - d. Cheney Flashing Company.
    - e. Hickman Company, W. P.
    - f. Merchant & Evans, Inc.
    - g. Metal-Era, Inc.
    - h. Metal-Fab Manufacturing, LLC.
    - i. Petersen Aluminum Corporation.
  2. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, thickness as required to meet performance requirements.
    - a. Surface: Smooth, flat finish.
    - b. Finish: Two-coat fluoropolymer.
    - c. Color: As selected by Architect from manufacturer's full range.
  3. Corners: Factory mitered and continuously welded.
  4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
  5. Special Fabrications: As indicated on Drawings.

## 2.4 ROOF-EDGE DRAINAGE SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Architectural Products Company.
  2. ATAS International, Inc.
  3. Castle Metal Products.
  4. Cheney Flashing Company.
  5. Hickman Company, W. P.
  6. Metal-Era, Inc.
  7. Metal-Fab Manufacturing, LLC.
  8. National Sheet Metal Systems, Inc.
  9. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.

- B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
  - 1. Aluminum Sheet: 0.040 inch thick.
  - 2. Gutter Profile: As indicated according to SMACNA's "Architectural Sheet Metal Manual."
  - 3. Corners: Factory mitered and continuously welded.
  - 4. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.
  - 5. Gutter Accessories: As selected by Architect.
- C. Downspouts: Shape as indicated on Drawings, complete with elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
  - 1. Formed Aluminum: 0.040 inch thick.
- D. Aluminum Finish: Two-coat fluoropolymer.
  - 1. Color: As selected by Architect from manufacturer's full range.

## 2.5 REGLETS AND COUNTERFLASHINGS

- 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. Cheney Flashing Company.
  - 2. Fry Reglet Corporation.
  - 3. Keystone Flashing Company, Inc.
  - 4. National Sheet Metal Systems, Inc.
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
  - 1. Formed Aluminum: 0.024 inch thick.
  - 2. Stainless Steel: 0.019 inch thick.
  - 3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
- C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
  - 1. Formed Aluminum: 0.024 inch thick.
  - 2. Stainless Steel: 0.019 inch thick.



D. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. Aluminum Finish: Two-coat fluoropolymer.

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

F. Stainless-Steel Finish: No.2B (bright, cold rolled, unpolished).

2.6 MATERIALS

- A. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
- B. Aluminum Extrusions: ASTM B221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:
- C. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type304.

2.7 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
  1. Thermal Stability: ASTM D1970; stable after testing at 240 deg F.
  2. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 deg F.
  3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Carlisle Coatings & Waterproofing; CCW WIP300HT.
    - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
    - c. Henry Company; Blueskin PE200HT.
    - d. Metal-Fab Manufacturing, LLC; MetShield.
    - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- B. Felt: ASTM D226, Type II (No.30), asphalt-saturated organic felt, nonperforated.
- C. Slip Sheet: Rosin-sized building paper, 3-lb/100 sq. ft. minimum.

## 2.8 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
  - 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
  - 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
  - 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- B. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- C. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.
- E. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

## 2.9 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are 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. Coil-Coated Aluminum Sheet Finishes:
  - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
- B. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- C. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

### 3.3 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
  - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
  - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
  - 3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
  - 4. Torch cutting of roof specialties is not permitted.
  - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact

surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless-steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints with elastomeric or butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

### 3.4 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.

### 3.5 ROOF-EDGE SPECIALITIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

### 3.6 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 30 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
  - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
  - 1. Provide elbows at base of downspout to direct water away from building.
  - 2. Connect downspouts to underground drainage system indicated.

### 3.7 REGLET AND COUNTERFLASHING INSTALLATION

- A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.
- C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric or butyl sealant. Fit counterflashings tightly to base flashings.

### 3.8 CLEANING AND PROTECTION

- A. 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.
- B. 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

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## **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. Polysulfide joint sealants.
4. Latex joint sealants.
5. Solvent-release-curing joint sealants.
6. Preformed joint sealants.
7. Acoustical joint sealants.

- B. Related Sections include the following:

1. Section 042000, "Unit Masonry " for masonry control and expansion joint fillers and gaskets.
2. Section 088000, "Glazing" for glazing sealants.
3. Section 092900, "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
4. Section 095113, "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

#### **1.3 PREINSTALLATION MEETINGS**

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

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. 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. Product test reports.
- B. Preconstruction compatibility and adhesion test reports.
- C. Preconstruction field-adhesion test reports.
- D. Field-adhesion test reports.
- E. Sample warranties.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

## 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

## 1.8 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer'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: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.



## 2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dow Corning Corporation; NS.
    - b. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 728 NS.
- B. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dow Corning Corporation; 799.
    - b. Soudal USA; RTV 50.
- C. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 199 PG.
    - b. Sika Corporation U.S.; Sikasil-N Plus US.

## 2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Exterior Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Pecora Corporation; 864NST.
    - b. Dow Corning Corporation; 795.
    - c. Momentive Performance Materials; GE Construction Sealants; SilPruf NB.
    - d. Tremco Incorporated; Spectrem 2.
  - 2. Applications: Use for exterior non-traffic bearing joints:
    - a. Control and soft joints in masonry.
    - b. Joints between concrete or stone and other materials.
    - c. Joints between metal frames and other materials.

- d. Other exterior non-traffic bearing joints for which no other sealant is indicated.
- C. Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Tremco Incorporated; Spectrem 4-TS.

## 2.4 URETHANE JOINT SEALANTS

- A. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. BASF Construction Chemicals, LLC, Building Systems; Sonolastic SL 1.
    - b. Pecora Corporation; NR-201.
    - c. Polymeric Systems, Inc.; Flexiprene 952.
    - d. Schnee-Morehead, Inc.; an ITW company; Permthane SM7101.
    - e. Sherwin-Williams Company (The); Stampede 1SL.
- B. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Pecora Corporation; Dynatrol II.
- C. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Sherwin-Williams Company (The); Stampede-2NS.
- D. Exterior Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T and NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Tremco Incorporated; Dymeric 240.
    - b. BASF Building Systems; Sonneborn; NP 2.
  - 2. Applications: Use for exterior non-traffic bearing joints.
    - a. Control, expansion, and soft joints in masonry.

- b. Joints between concrete and other materials.
  - c. Joints between metal frames and other materials.
  - d. Other exterior non-traffic bearing joints for which no other sealant is indicated.
- E. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T and NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Bostik, Inc.; Chem-Calk 505.
    - b. LymTal International, Inc.; Iso-Flex 881.
    - c. Sika Corporation U.S.; Sikaflex - 2c NS EZ Mix.
- F. Traffic Joints Urethane, M, P, 25, T, NT: Multicomponent, pourable, self leveling, plus 25 percent and minus 25 percent movement capability, traffic use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Pecora Corporation; Urexpan NR 200
    - b. Sherwin-Williams Company (The); Stampede-2SL.
    - c. Tremco Incorporated; THC 900/901.
    - d. BASF Building Systems; Sonneborn; Sonolastic SL2.
  - 2. Applications: Use for interior and exterior horizontal traffic bearing joints:
    - a. Joints in concrete floors and paving.
    - b. Soft joints in unit pavers.
    - c. Other traffic bearing joints for which no other sealant is indicated.

## 2.5 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
  - 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. Pecora; 898; Sanitary Mildew Resistant Silicone Sealant.
    - b. Dow Corning Corporation; 786-M White.
    - c. Momentive performance materials; GE Construction Sealants; SCS1700 Sanitary.
    - d. Tremco Incorporated; Tremsil 200.
  - 2. Applications: Use for kitchens, bathrooms, toilet rooms, lockers, and other wet areas:
    - a. Joints between plumbing fixtures and floor and wall surfaces.

- b. Joints between kitchen and bath countertops and wall surfaces.
- c. Joints between lockers and toilet accessories and adjacent surfaces.
- d. Joints between sanitary wall panels and adjacent or penetrating materials.

## 2.6 LATEX JOINT SEALANTS

- A. Interior Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF. single component, nonstaining, nonbleeding, nonsagging.
  - 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. Pecora Corporation; AC-20.
    - b. Sherwin-Williams Company (The); 950A.
    - c. BASF Construction Chemicals, LLC, Building Systems; Sonolac.
    - d. Tremco Incorporated; Tremflex 834.
  - 2. Applications: Use for interior joints, except where sanitary sealant is required.
    - a. Interior wall and ceiling control joints.
    - b. Interior joints between door and window frames and wall surfaces.
    - c. Other interior joints for which no other type of sealant is indicated.

## 2.7 BUTYL JOINT SEALANTS

- A. Exterior Metal Lap Joint Sealant: ASTM C1311, butyl or polyisobutylene, nondrying, non-skinning, non-curing.
  - 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. Pecora; BC-98; Butyl Rubber Sealant.
    - b. Sherwin-Williams; White Lightning; Butyl Rubber Caulk.
    - c. Tremco, Inc.; Tremco Butyl Sealant.
  - 2. Applications: Concealed sealant bead in sheet metal and flashing work:
    - a. Concealed sealant bead in sheet metal work.
    - b. Concealed sealant bead in vapor barrier.
    - c. Concealed sealant bead in through wall flashing.
    - d. Other concealed sealant joints where specified in other Sections.

## 2.8 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, but are not limited to, the following:
    - a. Dow Corning Corporation; 123 Silicone Seal.
    - b. Momentive performance Materials; GE Advanced Materials - Silicones; UltraSpan US1100.
    - c. May National Associates, Inc.; Bondaflex Silbridge 300.

- d. Pecora Corporation; Sil-Span.
  - e. Sealex, Inc.; ImmerSeal.
- 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, but are not limited to, the following:
    - a. EMSEAL Joint Systems, Ltd.; Emseal 25V.
    - b. Sandell Manufacturing Co., Inc.; Polyseal.
    - c. Schul International, Inc.; Sealtite.
    - d. Schul International, Inc.; Polytite Standard.
    - e. Willseal USA, LLC; Willseal 600.

## 2.9 JOINT SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), or Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

## 2.10 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting 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.
  - 1. Remove laitance and form-release agents from concrete.
  - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 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.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants 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.
- F. 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.
- G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- H. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.

### 3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet 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.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

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

3.6 PROTECTION

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

END OF SECTION 07 9200



## **SECTION 081113 - HOLLOW METAL DOORS AND FRAMES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.3 SUMMARY**

- A. Section Includes:

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

- B. Related Sections:

- 1. Section 042000, "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
  - 2. Section 088000, "Glazing" for glass view panels in hollow metal doors.
  - 3. Section 087100, "Door Hardware".
  - 4. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

- C. References:

- 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.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  1. Include construction details, material descriptions, core descriptions, fire-resistance ratings and finishes.
- B. 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.
- C. Shop Drawings: Include the following:
  1. Elevations of each door type.
  2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of anchorages, joints, field splices, and connections.
  7. Details of accessories.
  8. Details of moldings, removable stops, and glazing.
  9. Details of conduit and preparations for power, signal, and control systems.
- D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified agency.

## 1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. 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".
- C. 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.
- 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.
  - 1. Special Warranty Period: 1 year from Substantial Completion.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
  - 1. Warranty Period: 1 year from Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Ceco Door Products.
  - 2. Curries Co.
  - 3. Steelcraft; an Ingersoll-Rand company.

### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

### 2.3 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. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. 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, and HMMA 867 for door construction.

1. Design: Flush panel.
  2. Core Construction: Foamed in place polyurethane and steel reinforced core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".
    - a. Provide 22 gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
    - b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
    - c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.
  3. Level/Model: Level 2 and Physical Performance Level A (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
  4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
  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. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
  6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
  7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. 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: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
  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: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
  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.
  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.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Trio-E Series.
2. Curries Company (CU) - Energy Efficient - 797 Mercury Series.
3. Or Approved Equal.

## 2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.
- C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
  1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
  2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
  3. Manufacturers Basis of Design:
    - a. Curries Company (CU) – CM Series.
    - b. Curries Company (CU) – M Series.
- D. 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 -1.3-mm) thick steel sheet.
  3. Manufacturers Basis of Design:
    - a. Curries Company (CU) - M Series.
- E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

## 2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick,

- with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
  3. 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 A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

## 2.6 LIGHT OPENINGS AND GLAZING

- 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 (16 mm) 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. Glazing: Comply with requirements in Division 08 Section "Glazing" and with the hollow metal door manufacturer's written instructions.

## 2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

## 2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for 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.
- 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 joints continuously through full throat width of frames, including rabbets, soffits, and stops; 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. Fabricate knocked-down frames with mitered or coped corners, for field assembly.
  - 4. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
  - 5. 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.
  - 6. 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.
  - 7. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".



8. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
  9. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
  10. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  11. Jamb Anchors: Knock-down frames are acceptable. 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.
  12. 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".
  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. 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.

## 2.9 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. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

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

### 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
  - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  - 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
  - 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  - 7. 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 Steel Doors:
    - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
    - c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
    - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

## **SECTION 081613 - FRP FLUSH DOORS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Fiberglass reinforced polyester (FRP) flush doors and frames.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finishes, and installation.
- B. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
- C. Samples:
  - 1. Door: Submit manufacturer's sample of door showing face sheets, core, framing, and finish.
  - 2. Color: Submit manufacturer's samples of standard colors of doors and frames.
- D. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- E. Manufacturer's Project References: Submit list of successfully completed projects including project name and location, name of architect, and type and quantity of doors manufactured.
- F. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.
- G. Warranty: Submit manufacturer's standard warranty.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years successful experience.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Handling: Protect materials and finish from damage during handling and installation.

#### 1.6 WARRANTY

- A. Warrant doors, frames, and factory hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
- B. Warranty Period: Ten years starting on date of shipment.

### PART 2 - PRODUCTS

#### 2.1 FLUSH TYPE EXTERIOR FRP DOORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Cline Doors; Series 500 SE stile and rail doors, or comparable product by one of the following:
  - 1. Architectural Doors Inc.
  - 2. Special-Lite.
- B. Test Reports and Performance Requirements:
  - 1. Door Leaf Requirement Tests: Door leaf without frame or hardware and with a minimum lite cut out of 12 inches by 24 inches is to meet the following criteria:
    - a. Concentrated Load Bow Test: 4200 lbs. minimum load with no permanent deflection to door leaf.
    - b. Torsion Twist Test: @300 lbs. minimum load with no permanent set to door leaf.
  - 2. Face Sheet Requirement Tests: FRP material and FRP face sheets with core material are to meet the following criteria:

- a. Center Door Section (face sheet/core/face sheet):
  - 1) Gardner Impact Test - ASTM D5420 – 411.84 in-lb.
- b. FRP Material (MR85):
  - 1) Flexural Strength Test:
    - a) ASTM D790 - 22,680 psi (inward).
    - b) 24,400 psi (outward).
  - 2) Izod Impact Strength Test:
    - a) ASTM D256 - 15.36 ft-lb./in thickness.
  - 3) Barcol Hardness - ASTM D5420 – 50.

C. Materials:

- 1. Aluminum Members:
  - a. Doors, frames, miscellaneous components, and entrance systems accessories are to be from the same manufacturer. Splitting the source for these items will not be permitted.
  - b. Provide alloy and temper as recommended for resistance to corrosion and color control. Aluminum member references are ASTM B 221 for extrusions and ASTM B 209 for sheets.
- 2. Aluminum Edged Fiberglass (FRP) Panels:
  - a. Construction: Panels will be constructed of two sheets of 0.120 fiberglass sheets bonded to 3/4-inch core material. Panel thickness will be 1-inch. An aluminum frame surrounds the perimeter of the panel, and measures 1 inch by 1 inch by 1 inch with 1/8-inch wall thickness.
  - b. Wood edged panels will not be accepted.
  - c. Core material will be 25-psi density polystyrene with a flame spread rating higher than 25 requiring an aluminum liner between the FRP face sheet and the urethane core material. Core material must have a proven record for use in panel fabrication without delaminating. Urethane core panels will require a letter from the manufacturer offering special guarantee that the FRP face sheets will not delaminate (bubble) for a period of 10 years, and that the manufacturer will cover all replacement costs if delamination does occur.
  - d. FRP face sheets will be 0.120 minimum thickness with a pebble like surface.
  - e. FRP face sheets are MR85 high impact frp material that has been tested by ASTM D5420 Gardner Impact Test with "Mean Failure Energy" rating no lower than 411.84 in-lb.
  - f. Color will be selected from CDS color chart.
- 3. Extra Heavy Duty Fiberglass Wide Stile (FRP) Doors:
  - a. Structural Main Frame: Doors have an aluminum main frame constructed from extruded aluminum 6063 -T6 alloy. Doors are 1-3/4 inch thick. Main frame tube is to be a single extruded unit measuring 1-1/2 inches by 5-1/2 inches

- (O.D.) on both side stiles, and 6-inches (O.D.) Top and Bottom rails. Spliced extrusions that are joined together to measure 6 inches will not be accepted.
- b. Main Frame Wall Thickness:
    - 1) Side Stiles: Minimum 3/16 inch thick hinge edge wall.
    - 2) Top and Bottom Rails: Minimum 1/8 inch thick outside edge wall. (tie rod spline built into tube)
    - 3) All Rails and Stiles: Minimum 1/8 inch thick face walls.
    - 4) All Rails and Stiles: Minimum 1/8 inch thick inside edge wall.
  - c. Main Frame Joinery: Assembly for the meeting joints of the Rails and Stiles on the main frame are to be mortise & tenon on all four joints:
    - 1) Secured with:
      - a) 2 Tie Rods in Head Rail
      - b) 1 Tie Rod in Bottom Rail
  - d. Welded joints will not be accepted.
4. Inter-Loc Edge Trim: All aluminum trim is completely removable. All parts of the door are replaceable and repairable in the field. No fastening devices are exposed on the Stile Edge Trims.
- a. Snap-on or screw-on stile trim will not be accepted.
5. Weatherstripping: Center stiles of pairs will have pile weather-stripping 0.500 backing width, 0.5 inch pile height.
6. Hardware Reinforcing: Closer reinforcing to be 3/16 inch steel inserted into head rail. Other surface applied hardware is reinforced with the standard main frame tube wall thickness of 1/8 inch. Reinforcing for mortise and concealed hardware is to be done per template requirements.
- a. Hex or thru bolts will not be accepted.
  - b. Flush mounted door pulls must be provided as part of hardware requirement.
7. Wide Stile FRP doors will carry a 25 year limited warranty on doors structural integrity, main frame, and the lamination between face sheets and core. Warrantees are to be in writing from the door manufacturer.

## 2.2 ALUMINUM FINISHES

### A. Anodized Finish: Class I finish, 0.7 mils thick.

- 1. Clear 215 R1, AA-M10C12C22A41, Class I, 0.7 mils thick.

## PART 3 - EXECUTION



### 3.1 EXAMINATION

- A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

### 3.2 PREPARATION

- A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

### 3.3 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.
- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.
- E. Set thresholds in bed of mastic and backseal.
- F. Install exterior doors to be weathertight in closed position.
- G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- H. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

### 3.5 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

### 3.6 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.7 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 081613

## **SECTION 083113 - ACCESS DOORS AND FRAMES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Access doors and frames for walls and ceilings.
  - 2. Floor access doors and frames.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
- D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

### **PART 2 - PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA252 or UL10B for fire-rated access door assemblies installed vertically.

## 2.2 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTMA36/A36M.
  1. ASTMA123/A123M, for galvanizing steel and iron products.
  2. ASTMA153/A153M, for galvanizing steel and iron hardware.
- B. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTMA591/A591M with cold-rolled steel sheet substrate complying with ASTMA1008/A1008M, Commercial Steel (CS), exposed.
- C. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

## 2.3 ACCESS DOORS AND FRAMES

- 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. Babcock-Davis.
  2. J. L. Industries, Inc.
  3. Karp Associates, Inc.
  4. Larsen's Manufacturing Company.
  5. Milcor Inc.
  6. Nystrom, Inc.
- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- C. Flush Access Doors with Exposed Flanges:
  1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
  2. Locations: Wall and ceiling.
  3. Door Size: As indicated.
  4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage.
    - a. Finish: Factory prime.
  5. Frame Material: Same material, thickness, and finish as door.
  6. Hinges: Manufacturer's standard.
  7. Hardware: Lock.
- D. Flush Access Doors with Concealed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
2. Locations: Wall and ceiling.
3. Door Size: As indicated.
4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage.
  - a. Finish: Factory prime.
5. Frame Material: Same material and thickness as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

E. Hardware:

1. Latch: Cam latch operated by screwdriver.
2. Lock: Cylinder.
  - a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

F. Hardware: Stainless steel hinges with removable pin, screw driver slot with quarter turn cam lock, except for fire rated access doors.

## 2.4 FLOOR ACCESS DOORS AND FRAMES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Acudor Products, Inc. (aluminum only).
  2. Babcock-Davis, A Ciera Products Co.
  3. Bilco Company (The).
  4. Cendrex Inc.
  5. J. L. Industries, Inc.
  6. Nystrom, Inc.
- B. Floor Doors, General: Equip each door with adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with red vinyl grip that allows for one-handed closure, and recessed lift handle.
- C. Aluminum Floor Door: Single-leaf opening. Extruded-aluminum angle frame with 1/4-inch-thick, diamond-pattern, aluminum tread plate door; nonwatertight; loading capacity to support 150-lbf/sq. ft. pedestrian live load
- D. Hardware: Provide the following:
1. Hinges: Heavy-duty, aluminum butt hinges with stainless-steel pins.
  2. Latch: Stainless-steel slam latch.
  3. Lock: none

4. Hardware Material: Manufacturer's standard.

## 2.5 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTMA36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTMA879/A879M, with cold-rolled steel sheet substrate complying with ASTMA1008/A1008M, Commercial Steel (CS), exposed.
- C. Frame Anchors: Same type as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTMA153/A153M or ASTM F2329.

## 2.6 ALUMINUM MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
  1. Mill finish, AA-M10 (Mechanical Finish: as fabricated, unspecified).
- B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
  1. Mill finish, AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Aluminum Sheet: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15; with minimum sheet thickness indicated representing specified thickness according to ANSI H35.2.
  1. Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
  2. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
  3. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
  4. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written specifications for cleaning, conversion coating, and painting.

## 2.7 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 attachment devices and fasteners of type required to secure access panels to types of supports indicated.
  - 1. For trimless frames with drywall bead, provide edge trim for gypsum board and gypsum base securely attached to perimeter of frames.
  - 2. Provide mounting holes in frames for attachment of units to metal or wood framing.
  - 3. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
  - 1. For cylinder lock, furnish two keys per lock and key all locks alike.

## 2.8 ACCESS DOOR SIZE

- A. Minimum Size: 24-inch by 32-inch for any items to be accessed requiring shoulders to fit through access door opening.
- B. Provide 32-inch by 40-inch doors in 6-inch thick or thicker block or stud walls.
- C. Provide 16-inch by 16-inch doors at locations where item to be accessed is entirely accessible and convenient to work on within 8-inches of access door face of wall or ceiling.
- D. Where access doors are required to accommodate filters or similar replacement/maintenance equipment, doors shall be of size to pass 1.25 percent of the least equipment dimension.
- E. Other sizes as indicated in the Construction Documents.

## 2.9 FLOOR HATCH SIZE

- A. Minimum Size: 30-inch by 30-inch..

## 2.10 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. Steel and Metallic-Coated-Steel Finishes:
  - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

## 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.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

### 3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113



## **SECTION 083310 - OVERHEAD COILING DOORS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes the following types of manually operated overhead coiling doors:
  - 1. Service doors.
- B. Related Sections include the following:
  - 1. Division 5 Section "Metal Fabrications" for miscellaneous steel supports.
  - 2. Division 8 Section "Door Hardware" for lock cylinders and keying.
  - 3. Division 9 Section "Painting" for field-applied paint finish.
  - 4. Division 26 Sections for electrical service and connections for powered operators and accessories.

#### **1.3 DEFINITIONS**

- A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
  - 1. Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
  - 2. Impact Test for Flying Debris: Comply with ASTM E 1996, tested according to ASTM E 1886.
    - a. Level of Protection: Unprotected.
- B. Operation-Cycle Requirements: Provide overhead coiling door components and operators capable of operating for not less than 10,000 cycles.

1. Include tamperproof cycle counter.

## 1.5 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
  1. Summary of forces and loads on walls and jambs.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.
- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available for units with factory-applied finishes.
- D. Qualification Data: For Installer.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.
  1. Obtain operators and controls from overhead coiling door manufacturer.

## 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:
  1. Alpine Overhead Doors, Inc.
  2. Atlas Door; Div. of Clopay Building Products Company, Inc.
  3. Cookson Company.
  4. Cornell Iron Works Inc.
  5. Dynamic Closures Corporation.
  6. Mahon Door Corporation.
  7. McKeon Rolling Steel Door Company, Inc.
  8. Metro Door.
  9. Overhead Door Corp.
  10. Pacific Rolling Doors Co.
  11. Raynor.

12. Southwestern Steel Rolling Door Co.
13. Wayne-Dalton Corp.
14. Windsor Door, a MAGNATRAX Corporation.

## 2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling door curtain of interlocking slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
  1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel (SS) sheet; complying with ASTM A 653/A 653M, G90 (Z275) coating designation.
    - a. Minimum Base-Metal (Uncoated) Thickness: 0.0209 inch.
    - b. Flat profile slats.
- B. Endlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Bottom Bar for Service Doors: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; galvanized, stainless-steel, or aluminum extrusions to suit type of curtain slats.
- D. Curtain Jamb Guides for Service Doors: Fabricate curtain jamb guides of steel angles or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch-thick galvanized steel sections complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

## 2.3 HOODS AND ACCESSORIES

- A. Hood: Form to act as weatherseal and entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and provide fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.
  1. Fabricate hoods for steel doors of minimum 0.028-inch-thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.
  2. Include automatic drop baffle to guard against passage of smoke or flame.
  3. Shape: Square.

- B. Integral Frame, Hood, and Fascia: Provide welded assemblies of the following sheet metal:
  - 1. Fabricate from minimum 0.064-inch-thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.
  - 2. Fabricate from minimum 0.0625-inch-thick stainless-steel sheet, Type 304, complying with ASTM A 240/A 240M or ASTM A 666.
- C. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.
  - 1. Provide pull-down straps or pole hooks for doors more than 84 inches high.
- D. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

## 2.4 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to door curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.
- D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate.

## 2.5 MANUAL DOOR OPERATORS

- A. Provide manual chain-hoist operators unless electric door operators are indicated.
- B. Push-up Operation: Design counterbalance mechanism so required lift or pull for door operation does not exceed 25 lbf.
- C. Chain-Hoist Operator: Provide manual chain-hoist operator consisting of endless steel hand chain, chain pocket wheel and guard, and gear-reduction unit with a maximum

35-lbf force for door operation. Provide alloy steel hand chain with chain holder secured to operator guide.

1. Provide through-wall shaft operator.

## 2.6 FINISHES, GENERAL

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.7 STEEL AND GALVANIZED STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard powder-coat finish consisting of primer and topcoat according to coating manufacturer's written instructions for cleaning, pretreatment, application, thermosetting, and minimum dry film thickness.
  1. Color and Gloss: As selected by Architect from manufacturer's full range.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. General: Install coiling doors and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports.

## 3.2 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion and with weathertight fit around entire perimeter.

## 3.3 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
  1. Complete installation and startup checks according to manufacturer's written instructions.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

#### 3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors. Refer to Division 1 Section.

#### **END OF SECTION 083310**

## **SECTION 083613 - SECTIONAL OVERHEAD DOORS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes electrically operated sectional overhead doors.
- B. Related Sections include the following:
  - 1. Division 5 Section "Metal Fabrications" for miscellaneous steel supports.
  - 2. Division 8 Section "Door Hardware" for lock cylinders and keying.
  - 3. Division 9 Section "Painting" for field-applied paint finish.
  - 4. Division 26 Sections for electrical service and connections for powered operators and accessories.

#### **1.3 DEFINITIONS**

- A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide sectional overhead doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
  - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
    - a. Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
  - 2. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283.
    - a. Maximum Rate: 0.08 cfm (0.038 L/s) at 15 mph (24 km/h).

3. Impact Test for Flying Debris: Comply with ASTM E 1996, tested according to ASTM E 1886.
  - a. Level of Protection: Basic Protection.
  - b. Wind Zone One: 110 mph (176 km/h), pressure test to 3/4 and 1-1/2 x design pressure (positive and negative).
- B. Operation-Cycle Requirements: Provide sectional overhead door components and operators capable of operating for not less than 10,000 cycles.

## 1.5 SUBMITTALS

- A. Product Data: For each type and size of sectional overhead door and accessory. Include the following:
  1. Summary of forces and loads on walls and jambs.
  2. Motors: Show nameplate data and ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
  1. Frame: 6 inches (150 mm) long.
  2. Panel: 6 inches (150 mm) square.
- E. Qualification Data: For Installer.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain sectional overhead doors through one source from a single manufacturer.
  1. Obtain operators and controls from sectional overhead door manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of sectional overhead doors and accessories and are based on the specific system indicated. Other manufacturers' systems with equal performance and dimensional characteristics may be considered. Refer to Division 1 Section "Product Requirements."



- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design Manufacturer as listed below per type.
- B. Haas Door Insulated Steel Doors – 600 Series. Subject to compliance with requirements, provide comparable product by one of the following:
  - 1. Steel Doors with Insulated Steel Panels and insulated glazing as shown in elevation:
    - a. Amarr Garage Doors.
    - b. Arm-R-Lite.
    - c. Clopay Building Products Company; a Griffon Company.
    - d. Martin Door Manufacturing.
    - e. Overhead Door Corp.
    - f. Raynor.
    - g. Wayne-Dalton Corp.
    - h. Windsor Door; a MAGNATRAX Corporation.
- C. Overhead Door Aluminum Glass Doors – Model 521. Subject to compliance with requirements, provide comparable product by one of the following:
  - 1. Aluminum Glazed Doors with Solid Lower Panels and insulated glazing as shown in elevation:
    - a. Amarr Garage Doors.
    - b. Arm-R-Lite.
    - c. Clopay Building Products Company; a Griffon Company.
    - d. Martin Door Manufacturing.
    - e. Overhead Door Corp.
    - f. Raynor.
    - g. Wayne-Dalton Corp.
    - h. Windsor Door; a MAGNATRAX Corporation.

### 2.2 STEEL SECTIONAL DOORS

- A. Construct door sections including face sheets and frames from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, G60 coating designation.

1. Minimum Base-Metal (Uncoated) Thickness for Section Faces: 0.053 inch
  2. Exterior-Section Face: Flat.
- B. Fabricate door panels from a single sheet to provide sections not more than 24 inches high and nominally 2 inches deep. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weathertight seal, with a reinforcing flange return.
1. For insulated doors, provide door sections with continuous thermal-break construction, separating faces of door.
- C. Enclose open sections with channel end stiles formed from not less than 0.064-inch-thick galvanized steel sheet and weld end stiles to door section in place. Provide intermediate stiles formed from not less than 0.064-inch-thick galvanized steel sheet, cut to door section profile, and welded in place.
1. Stile Spacing: Not more than 48 inches apart.
- D. Reinforce bottom section with a continuous channel or angle complying with bottom-section profile and allowing installation of astragal.
- E. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place.
- F. Provide reinforcement for hardware attachment.
- G. Thermal Insulation: Insulate inner core of steel sections with door manufacturer's standard polystyrene or polyurethane board insulation, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84; or with glass-fiber-board insulation. Secure insulation to door section. Enclose insulation completely within steel sections that incorporate the following inside facing material, with no exposed insulation material evident:
- H. Thermal Insulation: Insulate inner core of steel sections with door manufacturer's standard polyurethane insulation, foamed in place to completely fill inner core of section and pressure bonded to face sheets to prevent delamination under wind load, and with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within steel sections that incorporate the following inside facing material, with no exposed insulation material evident:
1. Inside Facing Material: Zinc-coated (galvanized) steel sheet with a minimum base (uncoated) metal thickness of 0.028 inch.
  2. Inside Facing Material: Manufacturer's standard prefinished hardboard panel, 1/8 inch thick and complying with AHA A 135.5.
- I. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

- J. Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation: Clean galvanized surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants.
    - a. Pretreat zinc-coated steel, after cleaning, with a conversion coating of type suited to organic coating applied over it.
  2. Apply manufacturer's standard primer to both door faces after forming, according to coating manufacturer's written instructions for application and minimum dry film thickness.
  3. Apply manufacturer's standard primer and finish coats to interior- and exterior-door faces after forming, according to coating manufacturer's written instructions for application, thermosetting, and minimum dry film thickness.
  4. Apply manufacturer's standard primer and powder-coat finish to interior- and exterior-door faces after forming, according to coating manufacturer's written instructions for application, thermosetting, and minimum dry film thickness.
    - a. Color and Gloss: As selected by Architect from manufacturer's full range.

## 2.3 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS

### A. Glazed Sectional Overhead Doors.

1. Door Assembly: Stile and rail assembly secured with 1/4 inch diameter through rods.
  - a. Panel Thickness: 1-3/4 inches.
  - b. Center Stile Width: 2-11/16 inches.
  - c. End Stile Width: 3-5/16 inches.
  - d. Intermediate Rail Pair Width: 3-11/16 inches.
  - e. Top Rail Width: 2-3/8 inches.
  - f. Bottom Rail Width: 4-1/2 inches.
  - g. Aluminum Panels: 0.050 inch thick, aluminum.
  - h. Stiles and Rails: 6063 – T6 aluminum.
  - i. Springs: 50,000 cycles.
  - j. Glazing: 1/2 inch Tempered Insulating glass.
2. Finish and Color: Powder Coating Finish as selected by Architect from manufacturer's standard colors.
3. Windload Design: Provide to meet the Design/Performance requirements specified.
4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
5. Lock: Interior galvanized single unit.

6. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.

## 2.4 TRACKS, SUPPORTS, AND ACCESSORIES

- A. Tracks: Manufacturer's standard, galvanized steel track system, sized for door size and weight, designed for lift type indicated and clearances shown, and complying with ASTM A 653/A 653M for minimum G60 (Z180) zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track spaced at 2 inches (51 mm) apart for door-drop safety device. Slope tracks at proper angle from vertical or design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.
  1. Provide tracks configured for the following lift types:
    - a. Standard.
- B. Track Reinforcement and Supports: Galvanized steel track reinforcement and support members, complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
  1. Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal (ceiling) tracks with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks.
    - a. Repair galvanized coating on tracks according to ASTM A 780.
- C. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of overhead door.
  1. Provide motor-operated doors with combination bottom weatherseal and sensor edge.
  2. Provide continuous flexible seals at door jambs for a weathertight installation.
- D. Windows: Type and size indicated and in arrangement shown. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.
  1. Size: Manufacturer's standard for type of glazing indicated.
  2. Clear Float Glass: 3 mm thick and complying with ASTM C 1036, Type I, Class 1, Quality Q3.

## 2.5 HARDWARE

- A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.
- B. Hinges: Heavy-duty galvanized steel hinges of not less than 0.0747-inch- (1.9-mm-) thick, uncoated steel at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges where required, for doors exceeding 16 feet (4.87 m) in width, unless otherwise recommended by door manufacturer.
- C. Rollers: Heavy-duty rollers with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- (75-mm-) diameter roller tires for 3-inch- (75-mm-) wide track and 2-inch- (51-mm-) diameter roller tires for 2-inch- (51-mm-) wide track.
  - 1. Tire Material: Case-hardened steel.
- D. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.
- E. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.
- F. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
  - 1. Locking Bars: Single-jamb side, operable from inside only.
  - 2. Lock cylinder is specified in Division 8 Section "Door Hardware."
- G. Chain Lock Keeper: Suitable for padlock.
- H. If door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

## 2.6 COUNTERBALANCE MECHANISM

- A. Extension Spring: Counterbalance mechanism with aircraft-type steel cable over ball-bearing sheaves. Provide oil-tempered wired springs with internal safety rods. Combine operation with a spring bumper in each horizontal track to cushion door at end of opening operation.
- B. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from oil-tempered-steel wire complying with ASTM A 229/A 229M, Class II, mounted on a cross-header tube or steel shaft. Connect to door with galvanized

aircraft-type lift cables with cable safety factor of at least 5 to 1. Provide springs calibrated for a minimum of 10,000 cycles.

- C. Cable Drums: Cast-aluminum or gray-iron casting cable drums grooved to receive cable. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft. Provide one additional midpoint bracket for shafts up to 16 feet (4.87 m) long and two additional brackets at one-third points to support shafts more than 16 feet (4.87 m) long unless closer spacing is recommended by door manufacturer.
- D. Cable Safety Device: Include a spring-loaded, steel or bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either cable breaks.
- E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level shaft and prevent sag.
- F. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

## 2.7 ELECTRIC DOOR OPERATORS

- A. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycle requirements specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
- B. Comply with NFPA 70.
- C. Disconnect Device: Hand-operated disconnect device or mechanism for automatically engaging chain-and-sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount disconnect device and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70, Class 2 control circuit, maximum 24-V, ac or dc.
  - 1. Door-Operator Type: Unit consisting of electric motor, basis of design: Model RMX 208V/1 Phase.
- F. Electric Motors: High-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction from any position, at not less than 2/3 fps

(0.2 m/s) and not more than 1 fps (0.3 m/s), without exceeding nameplate ratings or service factor.

1. Type: Polyphase, medium-induction type.
  2. Service Factor: Comply with NEMA MG 1, unless otherwise indicated.
  3. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
  4. Provide open dripproof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.
  5. Provide totally enclosed, nonventilated or fan-cooled motor, fitted with plugged drain, and controller with NEMA ICS 6, Type 4 enclosure where indicated.
- G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
1. Provide full-guarded, surface-mounted, heavy-duty-type interior unit with general-purpose, NEMA ICS 6, Type 1 enclosure.
- H. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of sensor immediately stops and reverses downward door travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
    - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
  2. Pressure-Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Provide pneumatically actuated automatic bottom bar.
      - 1) Self-Monitoring Type: Four-wire configured device.
- I. Limit Switches: Adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- J. Radio Control: Radio control system consisting of the following:
1. Three-channel, universal coaxial receiver to open, close, and stop door; one per operator.
  2. Multifunction remote control.
  3. Remote antenna mounting kit.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.
- B. Fasten vertical track assembly to framing, spaced not less than 24 inches (600 mm) apart. Hang horizontal track from structural overhead framing with angle or channel hangers fastened to framing by welding or bolting or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

### 3.2 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup services.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.3 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and with weathertight fit around entire perimeter.
- B. Adjust belt-driven motors as follows:
  - 1. Use adjustable motor-mounting bases for belt-driven motors.
  - 2. Align pulleys and install belts.
  - 3. Tension belt according to manufacturer's written instructions.
- C. Touch-up Painting: Immediately after welding galvanized track to track supports, clean field welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780.

### 3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional overhead doors.

END OF SECTION 083613



## **SECTION 084113 - ALUMINUM-FRAMED STOREFRONTS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Exterior storefront framing.

#### **1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
  - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

- C. Samples: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
  - 1. Joinery, including concealed welds.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.
  - 5. Flashing and drainage.
- E. Delegated-Design Submittal: For aluminum-framed storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For aluminum-framed storefronts, accessories, and components, from manufacturer.
  - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Sample Warranties: For special warranties.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of

components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
  - a. Structural failures including, but not limited to, excessive deflection.
  - b. Noise or vibration caused by thermal movements.
  - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - d. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

- B. Finish Warranty: Include coverage for aluminum finishes degradation.

1. Provide a five year manufacturer's warranty.

- C. Glass Warranty: As specified in Section 088000.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer registered in the state where the project is located, as defined in Section 014000 "Quality Requirements," to design aluminum-framed storefront.

- B. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Aluminum-framed storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
  - a. Thermal stresses transferring to building structure.

- b. Glass breakage.
  - c. Noise or vibration created by wind and thermal and structural movements.
  - d. Loosening or weakening of fasteners, attachments, and other components.
  - e. Failure of operating units.
- C. Structural Loads:
  - 1. Wind Loads: As indicated on Drawings
  - 2. Seismic Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
  - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
  - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
    - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
- E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
  - 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
  - 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
  - 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

  - 1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
  - 1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
- H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.40 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
  2. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 68 as determined according to NFRC 500.
- I. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
1. Outdoor-Indoor Transmission Class: Minimum 27.
- J. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
  2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    - b. Low Exterior Ambient-Air Temperature: 0 deg F.
  3. Interior Ambient-Air Temperature: 75 deg F

## 2.2 MANUFACTURERS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide YKK YES 45 TU series storefront framing system, or comparable product by one of the following:
1. EFCO Corporation.
  2. Kawneer North America.
  3. TRACO.
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

## 2.3 EXTERIOR FRAMING SYSTEM

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
  2. Glazing System: Retained mechanically with gaskets on four sides.

3. Glazing Plane: As indicated.

- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
- F. Storefront Framing System:
  - 1. Description: Front set, flush glazed; head and sill members continuous; jambs and vertical mullions attached by screw spline joinery.
  - 2. Components: Manufacturer's standard extruded aluminum mullions, hinged mullions, 90 degree corner posts, and indicated shapes.
  - 3. Thermal Barrier: Manufacturer's standard.

## 2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 1. Sheet and Plate: ASTM B 209.
  - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
  - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
  - 4. Structural Profiles: ASTM B 308/B 308M.
  - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
  - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
  - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
  - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

## 2.5 GLAZING

- A. Glazing: As specified in Division 08 Section "Glazing."

- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

## 2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
- C. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

## 2.7 FABRICATION

- A. Form or extruded aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
  - 4. Physical and thermal isolation of glazing from framing members.
  - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 6. Provisions for field replacement of glazing from exterior.
  - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.8 ALUMINUM FINISHES

- A. High Performance Organic Coating Finish: Factory applied two-coat 70% Kynar resin by Auto Chem or 70% Hylar resin by Solvay Solexis, fluoropolymer based coating system, Polyvinylidene Fluoride (PVF-2), applied in accordance with YKK AP procedures and meeting AAMA 2605 specifications.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure non-movement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
  - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
  - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
  - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.



- D. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- E. Install glazing as specified in Division 08 Section "Glazing."
- F. Install weather-seal sealant as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

### 3.3 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
  - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  - 3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
  - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 084113

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## **SECTION 084523 - TRANSLUCENT FIBERGLASS PANEL UNIT WALL SYSTEM**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes the insulated translucent sandwich panel system and accessories, factory unitized, as shown and specified. Work includes providing and installing:
  - 1. Flat factory prefabricated structural insulated translucent sandwich panels
  - 2. Aluminum installation system
  - 3. Aluminum sill flashing
  - 4. Opaque panels
- B. Related Sections:
  - 1. Structural Steel: Section 051200
  - 2. Flashing and Sheet Metal: Section 076200
  - 3. Sealants: Section 079200
  - 4. Metal Building Systems: Section 133419

#### **1.2 SUBMITTALS**

- A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.
- B. Submit shop drawings. Include elevations and details.
- C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
  - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
    - a. Sandwich panels: 14" x 28" units
    - b. Factory finished aluminum: 5" long sections
- D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
  - 1. Reports required are:

- a. International Building Code Evaluation Report
- b. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
- c. Burn Extent (ASTM D 635)
- d. Color Difference (ASTM D 2244)
- e. Impact Strength (UL 972)
- f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
- g. Bond Shear Strength (ASTM D 1002)
- h. Beam Bending Strength (ASTM E 72)
- i. Insulation U-Factor (NFRC 100)
- j. NFRC System U-Factor Certification (NFRC 700)
- k. Solar Heat Gain Coefficient (NFRC or Calculations)
- l. Condensation Resistance Factor (AAMA 1503)
- m. Air Leakage (ASTM E 283)
- n. Structural Performance (ASTM E 330)
- o. Water Penetration (ASTM E 331)
- p. 1200°F Fire Resistance (SWRI)
- q. Performance for Windows (AAMA/WDMA/CSA-101/I.S.2/A440-05)

### 1.3 QUALITY ASSURANCE

#### A. Manufacturer's Qualifications

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

- B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

### 1.4 PERFORMANCE REQUIREMENTS

- A. The manufacturer shall be responsible for the configuration and fabrication of the complete unitized panel system.

1. Include structural analysis data signed and sealed by the qualified professional engineer, licensed in the Commonwealth of Pennsylvania, responsible for their preparation.

2. Standard panel system shall have less than 0.01 cfm/ft<sup>2</sup> air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads: The manufacturer shall be responsible for the development of all specific design load criteria. Refer to the project Structural Drawings for general structural loading information.

## 1.5 DELIVERY STORAGE AND HANDLING

- A. Deliver panel system, components and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

## 1.6 WARRANTY

- A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.
- B. Kalwall Corporation, Tel: (800) 258-9777, Email: [info@kalwall.com](mailto:info@kalwall.com)

### 2.2 PANEL COMPONENTS

- A. Face Sheets
  1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
    - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
    - b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
  2. Interior face sheets:

- a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.
- b. Burn extent by ASTM D 635 shall be no greater than 1".

3. Exterior face sheets:

- a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
- b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.

4. Appearance:

- a. Exterior face sheets: Smooth .070 inches thick and white in color.
- b. Interior face sheets: Smooth .052 inches thick and white in color.
- c. Face sheets shall not vary more than  $\pm 10\%$  in thickness and be uniform in color.

B. Grid Core

1. Thermally broken composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite.

C. Laminate Adhesive

1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
  - a. 50% Relative Humidity at 68° F: 540 PSI
  - b. 182° F: 100 PSI
  - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
  - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

## 2.3 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
  - 1. Thickness: 2-3/4"
  - 2. Light transmission: 14%
  - 3. Solar heat gain coefficient: 0.18.
  - 4. Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid, 0.05 U.
  - 5. Complete insulated panel system shall have NFRC certified U-factor of 0.05 U.
  - 6. Grid pattern: Nominal size: 12" x 24"; pattern: Shoji.
- B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.
- C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.
- D. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

## 2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

- A. Closure system: Thermally broken extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- D. Finish:
  - 1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be gray #80 (selected from manufacturer's standards).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Installer shall examine substrates, supporting structure and installation conditions.
- B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

### 3.3 INSTALLATION

- A. Install the panel system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.
  1. Anchor component parts securely in place by permanent mechanical attachment system.
  2. Accommodate thermal and mechanical movements.
  3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

### 3.4 CLEANING

- A. Clean the panel system interior and exterior, immediately after installation.
- B. Refer to manufacturer's written recommendations.

END OF SECTION 084523



## **SECTION 085200 - ALUMINUM WINDOWS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes operable aluminum-framed windows for exterior locations.
- B. Related Sections include the following:
  - 1. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.

#### **1.3 DEFINITIONS**

- A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:
  - 1. AW: Architectural.
  - 2. HC: Heavy Commercial.
  - 3. C: Commercial.
  - 4. LC: Light Commercial.
  - 5. R: Residential.
- B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:
  - 1. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.
- C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
- D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:
  - 1. Size indicated on Drawings.
- B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
  - 1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
    - a. Basic Wind Speed: 115 mph.
    - b. Importance Factor: I.
    - c. Exposure Category: C.
  - 2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.
- C. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces.

#### 1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
  - 1. Mullion details, including reinforcement and stiffeners.
  - 2. Joinery details.
  - 3. Expansion provisions.
  - 4. Flashing and drainage details.

5. Weather-stripping details.
  6. Thermal-break details.
  7. Glazing details.
  8. Window cleaning provisions.
  9. Window System Operators: Show locations, mounting, and details for installing operator components and controls.
  10. Window System Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
1. Include similar Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For aluminum windows and components required, prepared on Samples of size indicated below.
1. Main Framing Member: 12-inch-long, full-size sections of extrusions with factory-applied color finish.
  2. Window Corner Fabrication: 12-by-12-inch-long, full-size window corner including full-size sections of extrusions with factory-applied color finish, weather stripping, and glazing.
  3. Operable Window: Full-size unit with factory-applied finish.
  4. Hardware: Full-size units with factory-applied finishes.
  5. Weather Stripping: 12-inch-long sections.
- E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.
- F. Maintenance Data: For operable window sash, operating hardware and finishes to include in maintenance manuals.
- G. Warranty: Special warranty specified in this Section.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  2. Engineering Responsibility: Preparation of data for aluminum windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

- C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements." Do not modify size and dimensional requirements.
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- F. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
- G. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

## 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify aluminum window 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 aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

## 1.8 WARRANTY

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

1. Failures include, but are not limited to, the following:
  - a. Failure to meet performance requirements.
  - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
  - c. Faulty operation of movable sash and hardware.
  - d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
  - e. Failure of insulating glass.
2. Warranty Period:
  - a. Window: Three years from date of Substantial Completion.
  - b. Glazing: Five years from date of Substantial Completion.
  - c. Metal Finish: Five years from date of Substantial Completion.

## 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:
  1. Boyd Aluminum Manufacturing.
  2. Custom Window Company.
  3. EFCO Corporation.
  4. EXTECH Exterior Technologies, Inc.
  5. Fleetwood Aluminum Products, Inc.
  6. Gerkin Windows and Doors.
  7. Graham Architectural Products Corp.
  8. Kawneer; an Alcoa Company.
  9. Mannix; a division of Interstate Window Corp.
  10. Thermal Windows, Inc.
  11. TRACO.
  12. Wausau Window and Wall Systems.
  13. Winco Window Company.
  14. Window Technologies, Inc.; Century Manufacturing, Inc.
  15. YKK AP America Inc.

### 2.2 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum

yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.

- B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
  - 1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
  - 2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.
  - 1. Weather-Stripping Material: Elastomeric cellular preformed gaskets complying with ASTM C 509.
  - 2. Weather-Stripping Material: Dense elastomeric gaskets complying with ASTM C 864.
  - 3. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.
- F. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
  - 1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.
- G. Replaceable Weather Seals: Comply with AAMA 701/702.
- H. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

## 2.3 WINDOW

- A. Window Type: Double hung.
- B. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS.
  - 1. Performance Class and Grade: HC 50.
  - 2. Performance Class: HC.
- C. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.
- D. Thermal Transmittance: Provide aluminum windows with a whole-window, U-factor maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to ASTM E 1423.
  - 1. As noted in Glazing Specification.
- E. Forced-Entry Resistance: Comply with Performance Grade 30 requirements when tested according to ASTM F 588.
- F. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA 101/I.S.2/NAFS.
- G. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA 101/I.S.2/NAFS for operating window types indicated.

## 2.4 GLAZING

- A. Glass and Glazing Materials: Refer to Division 8 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.

## 2.5 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide extruded, cast, or wrought aluminum.
- B. Counterbalancing Mechanism: Comply with AAMA 902.
  - 1. Sash Balance: Concealed, spring-loaded, block-and-tackle type, of size and capacity to hold sash stationary at any open position.

- C. Sill Cap/Track: Extruded-aluminum track with natural anodized finish, of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
- D. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
- E. Double-Hung Windows: Provide the following operating hardware:
  - 1. Sash Balances: Two per sash.
  - 2. Handle: Continuous, integral, sash pull-down on bottom rail of forward-placed operating sash.
  - 3. Sash Lock: Cam-action sweep lock and keeper on meeting rail; one per sash.

## 2.6 INSECT SCREENS

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on inside of window and provide for each operable exterior sash or ventilator.
  - 1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Architectural C-24 class.
  - 2. Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.
- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
  - 1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
  - 2. Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.040-inch wall thickness.
  - 3. Finish: Match aluminum window members.

## 2.7 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.



- C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
  2. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.
  3. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.
- D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
1. Horizontal-Sliding Windows: Provide operable sash with a double row of sliding weather stripping in horizontal rails and single- or double-row weather stripping in meeting or jamb stiles, as required to meet specified performance requirements. Provide compression-type weather stripping at perimeter of each movable panel where sliding-type weather stripping is not appropriate.
  2. Vertically Pivoted Windows: Provide double-row weather stripping.
- E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- F. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.
- G. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- H. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- (1.6-mm-) thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.
- I. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.
- J. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

## 2.8 FINISHES, GENERAL

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

## 2.9 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
  - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
  - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
  - 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.

3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- F. Connect automatic operators to building electrical system.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
  1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Remove and replace noncomplying aluminum window and retest as specified above.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window operating system. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 085200

## **SECTION 087100 - DOOR HARDWARE**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Sliding 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. 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.
- D. 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. UL 305 - Panic Hardware.

#### **1.2 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.

### 1.3 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.

#### 1.4 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".

#### 1.5 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.

## 1.6 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.

## 1.7 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. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
  - 1. Permanent cylinders, cores, and keys to be installed by Owner.
- D. 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 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.
  - 4. Manufacturers:
    - a. Bommer Industries (BO).
    - b. Hager Companies (HA).

- c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

## 2.3 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.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. 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: Manufacturer's Standard.
- D. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- E. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
  2. Manufacturers:
    - a. Corbin Russwin (RU) - Access 3 AP.
    - b. Sargent (SA) - Degree DG1.
    - c. No Substitution.
- F. 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. New System: Key locks to a new key system as directed by the Owner.

G. 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).

H. Construction Keying: Provide temporary keyed construction cores.

I. 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.

## 2.4 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

- a. Lund Equipment (LU).
- b. MMF Industries (MM).
- c. Telkee (TK).

## 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. Manufacturers:

- a. Corbin Russwin Hardware (RU) - ML2000 Series.
- b. 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. Sargent Manufacturing (SA) - 10X Line.

## 2.6 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.

## 2.7 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. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  9. 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.

## 2.8 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) - DC6000 Series.
    - b. Norton Rixson (NO) - 7500 Series.
    - c. Sargent Manufacturing (SA) - 351 Series.

## 2.9 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. Hager Companies (HA).
  - b. Rockwood (RO).
  - c. Trimco (TC).

## 2.10 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. Hager Companies (HA).
    - 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).

## 2.11 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).

## 2.12 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.

## 2.13 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.
- B. Manufacturer's Abbreviations:
1. MK - McKinney
  2. PE - Pemko
  3. SA - SARGENT
  4. RO - Rockwood
  5. RF - Rixson
  6. NO - Norton

#### **Hardware Sets**

##### **Set: 1.0**

NOT USED.

##### **Set: 2.0**

Doors: 11-2, 12-1, 12-2, 14-1, 16-2, 2-1, 4-1, B1-1, B1-2, B1-3, B2-1, V1-1

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Classroom Security Intruder Lock	DG164 8238 LNND	US26D	SA
2 Cylinder Core	DG1 6300	US15	SA
1 Door Closer	CPS7500	689	NO

1 Kick Plate	K1050 10" CSK BEV	US32D	RO
1 Threshold	278x292AFGPK MSES25SS		PE
1 Rain Guard	346C		PE
1 Gasketing (head/jamb)	S773BL		PE
1 Sweep (w/drip edge)	3452CNB		PE

**Set: 3.0**

Doors: 10-1

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Rim Exit Device, Storeroom	DG164 (12) 8804 ETND	US32D	SA
1 Cylinder Core	DG1 6300	US15	SA
1 Door Closer	R7500 (or) PR7500	689	NO
1 Kick Plate	K1050 10" CSK BEV	US32D	RO
1 Door Stop (wall / floor)	403 (or) 441CU	US26D	RO
1 Threshold (5/16" hgt)	166A MSES10SS		PE
1 Gasketing (head/jamb)	S88BL		PE
1 Sweep	315CN		PE

**Set: 4.0**

Doors: 11-1

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Rim Exit Device, Storeroom	DG164 (12) 8804 ETND	US32D	SA
1 Cylinder Core	DG1 6300	US15	SA
1 Door Closer	CLP7500	689	NO
1 Kick Plate	K1050 10" CSK BEV	US32D	RO
1 Threshold (5/16" hgt)	166A MSES10SS		PE
1 Gasketing (head/jamb)	S88BL		PE
1 Sweep	315CN		PE

**Set: 5.0**

Doors: 7-1, 8A-1, 7A-1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom Lock	DG164 10XG04 LND	US26D	SA
1 Cylinder Core	DG1 6300	US15	SA
1 Door Closer	R7500 (or) PR7500	689	NO
1 Kick Plate	K1050 10" CSK BEV	US32D	RO

1 Door Stop (wall / floor)	403 (or) 441CU	US26D	RO
3 Silencer	608 (or) 609		RO

**Set: 6.0**

Doors: 1-1, 3-1, 5-1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Office Lock	DG164 10XG05 LND	US26D	SA
1 Cylinder Core	DG1 6300	US15	SA
1 Door Closer	R7500 (or) PR7500	689	NO
1 Kick Plate	K1050 10" CSK BEV	US32D	RO
1 Door Stop (wall / floor)	403 (or) 441CU	US26D	RO
3 Silencer	608 (or) 609		RO

**Set: 7.0**

Doors: 13-1

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Office Lock	DG164 10XG05 LND	US26D	SA
1 Cylinder Core	DG1 6300	US15	SA
1 Door Closer	R7500 (or) PR7500	689	NO
1 Kick Plate	K1050 10" CSK BEV	US32D	RO
1 Door Stop (wall / floor)	403 (or) 441CU	US26D	RO
1 Threshold (5/16" hgt)	166A MSES10SS		PE
1 Gasketing (head/jamb)	S88BL		PE
1 Sweep	315CN		PE

**Set: 8.0**

Doors: 4-2, V1-2

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Passage Latch	10XU15 LND	US26D	SA
1 Door Closer	R7500 (or) PR7500	689	NO
1 Kick Plate	K1050 10" CSK BEV	US32D	RO
1 Door Stop (wall / floor)	403 (or) 441CU	US26D	RO
1 Threshold (5/16" hgt)	166A MSES10SS		PE
1 Gasketing (head/jamb)	S88BL		PE
1 Sweep	315CN		PE

**Set: 9.0**

Doors: 16-1

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Passage Latch	10XU15 LND	US26D	SA
1 Door Closer	R7500 (or) PR7500	689	NO
1 Kick Plate	K1050 10" CSK BEV	US32D	RO
1 Door Stop (wall / floor)	403 (or) 441CU	US26D	RO
1 Threshold (5/16" hgt)	166A MSES10SS		PE
1 Gasketing (head/jamb)	S88BL		PE
1 Sweep	315CN		PE

**Set: 10.0**

Doors: 6-1, 8B-1

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Privacy Lock	10XU65 LND	US26D	SA
1 Door Closer	R7500 (or) PR7500	689	NO
1 Mop Plate	K1050 4" CSK BEV	US32D	RO
1 Kick Plate	K1050 10" CSK BEV	US32D	RO
1 Door Stop (wall / floor)	403 (or) 441CU	US26D	RO
3 Silencer	608 (or) 609		RO

**Set: 11.0**

Doors: 14A

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Privacy Lock	10XU65 LND	US26D	SA
1 Door Closer	R7500 (or) PR7500	689	NO
1 Mop Plate	K1050 4" CSK BEV	US32D	RO
1 Kick Plate	K1050 10" CSK BEV	US32D	RO
1 Door Stop (wall / floor)	403 (or) 441CU	US26D	RO
1 Threshold (5/16" hgt)	166A MSES10SS		PE
1 Sweep	315CN		PE
3 Silencer	608 (or) 609		RO

**Set: 12.0**

Doors: 5-2, 7B-1

6 Hinge, Full Mortise	TA2714	US26D	MK
2 Half Dummy Trim	10XU93 LND	US26D	SA
2 Roller Latch	594	US26D	RO
2 Surf Overhead Stop	10-X36	652	RF
2 Silencer	608 (or) 609		RO

**END OF SECTION 087100**



## **SECTION 088000 – GLAZING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Windows.
  - 2. Doors.
  - 3. Interior borrowed lites.
- B. Related Sections
  - 1. Section 081113 "Hollow Metal Doors and Frames".

#### **1.3 DEFINITIONS**

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

#### **1.4 COORDINATION**

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

#### **1.5 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

2. Review temporary protection requirements for glazing during and after installation.

#### 1.6 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For the following products, in the form of 12-inch- square Samples for glass.
  1. Insulating glass for each designation indicated.
  2. Laminated glass.
- C. Glazing Accessory Samples: For gaskets, sealants, and colored spacers, in 12-inch lengths. Fire rated sealants.
- D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers and manufacturers of insulating-glass units.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass and glazing sealants.
  1. For glazing sealants, including fire rated glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Warranties: Special warranties specified in this Section.

#### 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

#### 1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
  - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
  - 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
  - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
  - 4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
  - 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.
  - 6. Testing may be addressed on finishes/mock-up material.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

#### 1.12 WARRANTY

- A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide Viracon glazing units, or comparable product by one of the following:
1. Pilkington.
  2. PPG Industries.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
1. Obtain tinted glass from single source from single manufacturer.
  2. Obtain reflective-coated glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
1. Design Wind Pressures: As indicated on Drawings.
    - a. Wind Design Data: As indicated on Drawings.
  2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
  3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
  2. For laminated-glass lites, properties are based on products of construction indicated.
  3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
  5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
  2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- E. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

## 2.4 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
1. For uncoated glass, comply with requirements for Condition A.
  2. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
- C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated
- D. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated

## 2.5 INSULATING-GLASS UNITS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
  2. Spacer Specifications: Use warm edge spacer technology (black color).
- B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

## 2.6 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Colors of Exposed Glazing Sealants: As selected by The Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dow Corning Corporation; 790.
    - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    - c. May National Associates, Inc.; Bondaflex Sil 290.
    - d. Pecora Corporation; 890.
    - e. Sika Corporation, Construction Products Division; SikaSil-C990.
    - f. Tremco Incorporated; Spectrem 1.

## 2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

## 2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.9 GLAZING GASKETS

- A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
  - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

## 2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.



1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  2. Presence and functioning of weep systems.
  3. Minimum required face and edge clearances.
  4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.

- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.8 MONOLITHIC-GLASS TYPES - SCHEDULE

- A. Clear fully tempered float glass.
  - 1. Thickness: 1/4 inch.
  - 2. Provide safety glazing labeling.
- B. Laminated Glass:
  - 1. Thickness: Minimum 1 inch.

### 3.9 INSULATING-GLASS TYPES - SCHEDULE

- A. Glass Type I: Viracon 1" VRE1-38 Insulating HS/HS
  - 1. Overall Unit Thickness: 1 inch.
  - 2. Thickness of Each Glass Lite: 1/4 inch.
  - 3. Outdoor Lite: Clear heat strengthened float glass with VRE-38 low E coating on #2 surface.
  - 4. Interspace Content: 1/2 inch air space, argon filled.
  - 5. Indoor Lite: Clear Heat Strengthened float glass.
  - 6. Winter Nighttime U-Factor: 0.30 percent maximum.
  - 7. Summer Daytime U-Factor: 0.26 maximum.
  - 8. Visible Light Transmittance: 36 percent minimum.
  - 9. Solar Heat Gain Coefficient: 0.23 maximum.
  - 10. Shading Coefficient: 0.27 minimum.

END OF SECTION 088000

## **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.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Samples: For the following products:
  - 1. Trim Accessories: 12-inch long samples of each trim accessory indicated.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

#### **1.5 FIELD CONDITIONS**

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

### 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. Basis of Design Product: Subject to compliance with requirements, provide products as manufactured by USG Corporation, or comparable product by one of the following:
  1. CertainTeed Corp.
  2. Georgia-Pacific Gypsum LLC.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
  1. Thickness: As indicated
  2. Long Edges: Tapered.
- C. Moisture-and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture-and mold-resistant core and paper surfaces.
  1. Core: 5/8 inch, Type X.
  2. Long Edges: Tapered.

### 2.4 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.

## 2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  3. Fill Coat: For second coat, use drying-type, all-purpose compound.
  4. Finish Coat: For third coat, use drying-type, all-purpose compound.

## 2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- C. Thermal Insulation: Refer to section 072100 "Thermal Insulation".
- D. Isolation Strip at Exterior Walls: Provide one of the following:
  1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- C. 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.
- D. Form control and expansion joints with space between edges of adjoining gypsum panels.
- E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  2. Fit gypsum panels around ducts, pipes, and conduits.
  3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and



trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

#### A. 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-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

### 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 The Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  1. Cornerbead: Use at outside corners, unless otherwise indicated.
- D. Aluminum Trim: Install in locations indicated on Drawings.

### 3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
- E. Maximum variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.

### 3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

## **SECTION 095113 - ACOUSTICAL PANEL CEILINGS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

#### **1.3 PREINSTALLATION MEETINGS**

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

#### **1.4 DEFINITIONS**

- A. The ICC-ES: ICC-Evaluation Service.

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
  - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
  - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Structural members to which suspension systems will be attached.
  - 3. Size and location of initial access modules for acoustical panels.
  - 4. Items penetrating finished ceiling including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
  - 5. Perimeter moldings.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.

### 2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
  - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
  - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- D. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
  - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.
- E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
  - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers'

proprietary product designations, provide products selected by The Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

## 2.3 ACOUSTICAL PANELS

- A. Basis of Design product: Armstrong Cortega #770, 2x2, white.
- B. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

## 2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
  - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

- D. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- E. Stabilizer Bars: Manufacturer's standard perimeter stabilizers.

## 2.5 METAL SUSPENSION SYSTEM

- A. Refer to Finish Schedule on Drawings for manufacturers and products:

## 2.6 METAL EDGE MOLDINGS AND TRIM

- 1. Manufacturers: Provide moldings and trim by manufacturers indicated as Basis of Design in this specification.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
  - 1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
  - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
- C. 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 and the following:
  - 1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

### 3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Metal roof decks, new or existing, shall not be used for suspension or support of ductwork, conduit, ceiling systems, lighting fixtures or any other miscellaneous equipment or items.
  - 1. All suspended items shall be supported from the structural members or a suspension system supported by the structural members. Include the above provisions in the contract specifications.
  - 2. When ponding occurs because of design of secondary drain system, the ponded water load should be included in the live load.
- C. 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 and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and



- the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  8. Do not attach hangers to steel deck tabs.
  9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
  2. Do not use exposed fasteners, including pop rivets, on moldings and trim unless approved by The Architect.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
    - a. As indicated on reflected ceiling plans.
  2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
  3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
  5. Install hold-down or impact clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.

6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

#### 3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

## **SECTION 096513 - RESILIENT BASE AND ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Resilient base.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

#### **1.4 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

## 1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 RESILIENT BASE

- A. Refer to Finish Schedule on Drawings for manufacturers, products, colors, and finishes.
- B. Lengths: Coils in manufacturer's standard length.
- C. Outside Corners: Job formed.
- D. Inside Corners: Job formed.

### 2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

## EXECUTION

### 2.3 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  1. Installation of resilient products indicates acceptance of surfaces and conditions.

## 2.4 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
  1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

## 2.5 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
  1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

- a. Form without producing discoloration (whitening) at bends.
- 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
  - a. Cope corners to minimize open joints.

## 2.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 096513

## **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 exterior substrates.
- B. Related Sections:
  - 1. 033000 Cast-In-Place Concrete.
  - 2. 042000 Unit Masonry.
  - 3. 051200 Structural Steel Framing.
  - 4. 055000 Metal Fabrications.
  - 5. 055213 Pipe and Tube Railings.
  - 6. 081113 Hollow Metal Doors and Frames.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
  - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  - 2. VOC content.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

#### 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.

#### 1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance of requirements, products by Sherwin Williams are the basis of design and set the standard of quality required.
  - 1. Equivalent products from Benjamin Moore and PPG are acceptable.

#### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.



- B. Colors: As selected by The Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Gypsum Board: 12 percent.
- C. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. 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.
- B. 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.
- C. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

- D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. 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.
- H. Aluminum Substrates: Remove loose surface oxidation.
- I. Wood Substrates:
  - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- J. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  - 4. 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 undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: The Township may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Professional, 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 SCHEDULE - EXTERIOR SURFACES – LATEX

- A. Total VOC content will not be increased by tints and colorants required.
- B. Shop Primed Ferrous Metal: Semi-Gloss Acrylic Enamel:
  - 1. Sherwin-Williams:
    - a. Primer: Pro Industrial Pro-Cryl Universal Primer.
    - b. Finish coats: Two coats Pro Industrial DTM Acrylic semi-gloss, B66 series.
  - 2. Equivalent Products from Benjamin Moore or PPG shall be acceptable.

C. Ferrous Metal: Semi-Gloss Acrylic Enamel:

1. Sherwin-Williams:
  - a. Primer: Pro Industrial Pro-Cryl Universal Primer.
  - b. Finish: Two coats Pro Industrial DTM Acrylic semi-gloss, B66 series.
2. Equivalent Products from Benjamin Moore or PPG shall be acceptable.

D. Galvanized Metals: Semi-gloss Acrylic Enamel: Pretreat as required by manufacturer.

1. Sherwin-Williams:
  - a. Primer: Pro Industrial Pro-Cryl Universal Primer.
  - b. Finish: Two coats Pro Industrial DTM Acrylic semi-gloss, B66 series.
2. Equivalent Products from Benjamin Moore or PPG shall be acceptable.

E. Concrete Masonry Units: Semi-Gloss Acrylic:

1. Sherwin-Williams:
  - a. Filler: One coat Prep Rite Interior/Exterior Block Filler B25 W25.
  - b. Finish: Two coats A-100 semi-gloss, A8.
2. Equivalent Products from Benjamin Moore or PPG shall be acceptable.

3.7 SCHEDULE - EXTERIOR SURFACES - HIGH PERFORMANCE

A. Shop Primed Ferrous Metal: Gloss Urethane:

1. Sherwin-Williams:
  - a. Primer: One coat Kem Bond HS Primer B50.
  - b. Finish: Two coats Hi-Solids Polyurethane B65.
2. Equivalent Products from Benjamin Moore or PPG shall be acceptable.

B. Ferrous Metals: Gloss Urethane:

1. Sherwin-Williams:
  - a. Primer: One coat Recoatable Epoxy Primer B67.
  - b. Finish: Two coats Hi-Solids Polyurethane B65.
2. Equivalent Products from Benjamin Moore or PPG shall be acceptable.

C. Galvanized Metals: Gloss Urethane:

1. Sherwin-Williams:

- a. Primer: One coat Macropoxy HS primer B58.
  - b. Finish: Two coats Hi Solids Polyurethane B65.
2. Equivalent Products from Benjamin Moore or PPG shall be acceptable.

END OF SECTION 099113

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## **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 interior substrates.
- B. Related Sections:
  - 1. Section 051200, "Structural Steel Framing".
  - 2. Section 055213, "Pipe and Tube Railings".
  - 3. Section 092900, "Gypsum Board".

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Show gray, "P" shade primer when color selection requires gray primer.

#### **1.4 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.

## 1.5 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, products by Sherwin Williams are the basis of design and set the standard of quality required.
  - 1. Equivalent products from Benjamin Moore and PPG shall be acceptable.

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As selected by Professional from manufacturer's full range.

## 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: per manufacturer's instructions.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.



- E. Proceed with coating application only after unsatisfactory conditions have been corrected.

- 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. 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.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 APPLICATION

- 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.

### 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 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 Professional, 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 SCHEDULE - INTERIOR SURFACES - LATEX

#### A. Concrete Masonry Units (CMU): Semi-Gloss Finish:

1. Sherwin-Williams:
  - a. Filler: One coat PrepRite Interior/Exterior Block Filler B25W25.
  - b. Finish: Two coats ProMar 200 Zero VOC, semi-gloss.
2. Equivalent product by Benjamin Moore or PPG

#### B. Concrete Masonry Units (CMU): Epoxy Finish at Wash Bay:

1. Sherwin-Williams:
  - a. Filler: One coat PrepRite Interior/Exterior Block Filler B25W25.
  - b. Finish: Two coats ProIndustrial High Performance Epoxy.
2. Equivalent product by Benjamin Moore or PPG.

#### C. Gypsum Board: Eggshell Finish:

1. Sherwin-Williams:
  - a. Primer: One coat ProMar 200 Zero VOC Primer.
  - b. Finish: Two coats ProIndustrial Pre-Catalyzed WaterBased Epoxy, egg-shell
2. Equivalent product by Benjamin Moore or PPG

#### D. Impact / moisture resistant Gypsum board - Eggshell Finish:

1. Sherwin-Williams:
  - a. Primer: One coat PrepRite ProBlock Latex Primer Sealer, B51-600, no substitutions
  - b. Finish: Two coats ProIndustrial Pre-Catalyzed WaterBased Epoxy, egg-shell
2. Equivalent product by Benjamin Moore or PPG

#### E. Gypsum Board: Semi-Gloss Finish:

1. Sherwin-Williams:
  - a. Primer: One coat ProMar 200 Zero VOC Primer.

- b. Finish: Two coats ProMar 200 Zero VOC, semi-gloss.
  - 2. Equivalent product by Benjamin Moore or PPG
- F. Shop Primed Ferrous Metal: Semi-Gloss Finish:
  - 1. Sherwin-Williams:
    - a. Primer: Pro Industrial Pro-Cryl Universal primer.
    - b. Finish: Two coats Pro Industrial High Performance Acrylic, semi-gloss.
  - 2. Equivalent product by Benjamin Moore or PPG
- G. Ferrous Metal and Galvanized Metals: Semi-Gloss Finish:
  - 1. Sherwin-Williams:
    - a. Primer: Pro Industrial Pro-Cryl Universal primer.
    - b. Finish: Two coats Pro Industrial High Performance Acrylic, semi-gloss.
  - 2. Equivalent product by Benjamin Moore or PPG
- H. Exposed Metal Deck & Joists: Flat Acrylic:
  - 1. Sherwin-Williams:
    - a. Primer: (Ferrous and Non-Ferrous Metal): ProIndustrial Pro-Cryl Primer.
    - b. Finish: ProIndustrial Waterborne Acrylic Dryfall, Flat.
  - 2. Equivalent product by Benjamin Moore or PPG

END OF SECTION 099123

## **SECTION 101100 - VISUAL DISPLAY UNITS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Glass Dry-Erase boards.
  - 2. Tackboards.
- B. Related Sections
  - 1. Section 061053 "Miscellaneous Rough Carpentry".

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show locations of panel joints.
  - 2. Include sections of typical trim members.
- C. Samples: For each exposed product and for each color and texture specified. Lined Markerboards (markerboards with permanent "staff" lines).

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Product test reports.
- B. Sample warranties.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance data.

## 1.6 WARRANTY

- A. Warranty: Manufacturer agrees to repair or replace components of visual display units that do not comply with requirements or that fail in materials or workmanship within the specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.

### 2.2 GLASS MARKERBOARDS

- A. Glass Markerboards: frameless, non-magnetic 6-mm tempered white glass dry-erase board, with smooth polished edge and eased corners.

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

- a. A-1 Visual Systems.
- b. Architectural School Products, Ltd.
- c. Claridge Products and Equipment, Inc.
- d. Clarus Glassboards, LLC.
- e. Egan Visual Inc.
- f. EverWhite.

- B. Mounting: Round, stainless steel standoffs, holding glass approximately 1 inch from wall surface; mounted through holes in markerboard.

- C. Color and Surface: Matte, white.

1. The glass shall be resistant to staining or ghosting.

- D. Marker Tray: Glass, supported by stainless steel clips.

- E. Size: 48 inches x 36 inches.

### 2.3 TACKBOARD ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Claridge Products and Equipment, Inc.
  - b. Marsh Industries, Inc.; Visual Products Group.
  - c. Platinum Visual Systems; a division of ABC School Equipment, Inc.
- B. Tackboard Panels:
  - 1. Facing: 1/4-inch thick, plastic-impregnated cork.
  - 2. Core: Manufacturer's standard.
- C. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch thick, extruded aluminum; of size and shape indicated on Drawings.
  - 1. Aluminum Finish: Clear anodic finish.
    - a. Color: As selected by Architect from full range of industry colors and color densities.
- D. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, designed to hold accessories.
  - 1. Size: Length indicated on Drawings.
  - 2. Tackboard Insert Color: As selected by Architect from full range of industry colors.
  - 3. Aluminum Color: Match finish of visual display assembly trim.

## 2.4 MATERIALS

- A. Extruded Aluminum: ASTM B 221, Alloy 6063.
- B. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- C. High-Pressure Plastic Laminate: NEMA LD 3.
- D. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.
- E. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

## 2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA611, AA-M12C22A31, Class II, 0.010 mm or thicker.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
  - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
  - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by The Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.

END OF SECTION 101100



## **SECTION 101400 – INTERIOR 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 SECTION INCLUDES**

- A. Room Identification signage.

#### **1.3 REFERENCES**

- A. ANSI 117.1 – For Buildings and Facilities
- B. ASTM International (ASTM) E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM International (ASTM) D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Provide photopolymer signage that conforms to the requirements of all regulatory agencies holding jurisdiction.
- B. Requirements:
  - 1. Comply with all applicable provisions of the ADA and ANSI A117.1-1998.
  - 2. Character Proportion: Letters and numbers on signs must have a width-to-height ratio between 3:5 and 1:1 and a stroke width-to-height ratio between 1:5 and 1:10.
  - 3. Color Contrast: Characters and symbols must contrast with their background - either light characters on a dark background or dark characters on a light background.
  - 4. Raised Characters or Symbols: Letters and numbers on signs must be raised 1/32 in (0.8 mm) minimum and be sans serif characters. Raised characters or symbols must be at least 5/8 in (16 mm) high, but no higher than 2 in (50 mm). Symbols or pictograms on signs must be raised 1/32 in (0.8 mm) minimum.
  - 5. Symbols of Accessibility: Accessible facilities required to be identified must use the international symbol of accessibility.
  - 6. Braille: Grade II with accompanying text.
  - 7. Mounting Plate: Provide metal mounting plate for mounting signs where wall finish is insulation system for manufactured metal building walls.

C. Fire Performance Characteristics:

1. Provide photopolymer signage with surface burning characteristics that consist of a flame spread of 75 and a smoke development of 120 when tested in accordance to UL 723 (ASTM E 84).

1.5 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
  2. Installation methods.
- B. Shop Drawings: Detail drawings showing sizes, lettering and graphics, construction details of each type of sign and mounting details with appropriate fasteners for specific project substrates.
- C. Selection Samples: For each finish product specified, two sets of color sheets representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each sign type and color specified, one sample, minimum size 6 inches (150 mm) square, representing actual product, color and patterns.
- E. Manufacturer's Installation Instructions: Printed installation instructions for each signage system.
- F. Message List: Signage report indicating signage location, text and sign type.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in unopened factory packaging.
- B. Inspect materials at delivery to verify there are no defects or damage.
- C. Store products in manufacturer's original packaging until ready for installation, in climate controlled location away from direct sunlight.
- D. Store and dispose of solvent-based materials, and materials used with solvent-based materials in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. Install products in an interior climate-controlled environment.
- B. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. At project closeout, provide to the Township or Township's representative a copy of the manufacturer's standard limited warranty against manufacturing defect outlining the terms, conditions and exclusions from coverage.

- 1. Duration: One (1) year from Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide signs manufactured by 2/90 Sign Systems or comparable product by one of the following, but not limited to:
  - 1. Advance Corporation; Braille-Tac Division.
  - 2. ASI Sign Systems, Inc.
  - 3. InPro Corporation; SignScape Signage and Wayfinding.
  - 4. iSign, Inc.
  - 5. Mohawk Sign Systems.
  - 6. Alpine Sign and Lighting.
  - 7. Michener's Engraving Inc.
- B. Provide all signage from one manufacturer, including necessary mounting options, fittings and fasteners.

### 2.2 SIGNAGE – GENERAL

- A. It is the intent of these specifications to establish a sign standard for the Township including but not limited to primary room identification, restrooms, conference rooms, and all code compliant signage. The signage contractor shall design and submit approval drawings for all sign types relevant to the project.
- B. Comply with all applicable provisions of the ADAAG and ANSI A117.1 codes that apply to the State and Local jurisdiction of the project.
- C. Typography: See Drawings. Copy shall be a clean and accurate reproduction of typeface(s) specified. Upper and lower case and all caps as indicated in Sign Type drawings and Signage Schedule. Letter spacing to be set by manufacturer.
- D. Arrows, symbols and pictograms will be provided in style, sizes, colors and spacing as indicated in drawings for each sign system.
- E. Braille
  - 1. Grade 2 Braille
- F. Design
  - 1. Text/Graphics Placement: As indicated on Drawings
  - 2. Font: As indicated on drawings
  - 3. Signage Profile and Frame pieces:

- a. Based on 2/90 Modular system

## 2.3 IDENTIFICATION SIGNAGE

- A. ADA Plate Color Selection – To be selected by The Architect from manufacturer standard selections.
- B. Raised Copy Color Selection: To be selected by The Architect from manufacturer standard color selections.
- C. Sign Type: Reference contract drawings.
- D. Mounting
  - 1. Double face tape and silicone mount.

## 2.4 SIGNAGE SCHEDULE

- A. Room signs: Furnish signs as indicated on the signage schedule and plan.
- B. Reference Drawings for Signage schedule.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that wall surface is dry and free from dirt, grease and loose paint.
- B. Complete all finishing operations, including painting, before beginning installation of signage systems.
- C. Do not begin installation until substrates have been properly prepared.
- D. If substrate preparation is the responsibility of another installer, notify The Architect of unsatisfactory preparation before proceeding.
- E. Examine signage for defects prior to installation. Do not install damaged signage.

### 3.2 PREPARATION

- A. Verify mounting heights and locations comply with referenced standards.
- B. Clean surfaces thoroughly prior to installation to remove dust, debris and loose particles.

- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best results for the substrate under the project conditions.

### 3.3 INSTALLATION

- A. Locate the signage system as indicated on drawings for the appropriate substrate and in accordance with manufacturer's installation instructions.
- B. Install signage systems level and plumb at the height indicated on the drawings.
- C. Mount in accordance with current ADA and State regulations.
- D. Provide BLANK back plate for all signage mounted to glass.

### 3.4 CLEANING

- A. At completion of installation, clean surfaces in accordance with manufacturer's instructions.

### 3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before substantial completion.

END OF SECTION 101400

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## **SECTION 101419 - DIMENSIONAL LETTER SIGNAGE**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Cutout dimensional characters.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: For dimensional letter signs.
  - 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
- C. Samples: For each type of exposed component, and exposed finish.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For signs to include in maintenance manuals.

#### **1.6 QUALITY ASSURANCE**

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

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of finishes beyond normal weathering.
    - b. Separation or delamination of sheet materials and components.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 DIMENSIONAL CHARACTERS

- A. Cast Aluminum Letters: Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines.
  - 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. ACE Sign Systems, Inc.
    - b. APCO Graphics, Inc.
    - c. Gemini Incorporated.
    - d. InPro Corporation.
    - e. Nelson-Harkins Industries.
    - f. Southwell Company (The).
  - 2. Character Material: Brushed Stainless Steel, No. 4 Finish.
  - 3. Character Height: 12 inch tall.
  - 4. Typeface: Arial.
  - 5. Thickness: 2 ½ inches.
  - 6. Finishes: Two-component acrylic polyurethane.
  - 7. Mounting: Direct mount with 1 ½ inch standoff spacers.

### 2.2 MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.



## 2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
  - 1. Use concealed fasteners and anchors unless indicated to be exposed.
  - 2. For exterior exposure, furnish nonferrous-metal, stainless-steel or hot-dip galvanized devices unless otherwise indicated.
  - 3. Exposed Metal-Fastener Components, General:
    - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
  - 4. Sign Mounting Fasteners:
    - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.4 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
  - 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  - 2. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
  - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
  - 4. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

## 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 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
  - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
  - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.

### 3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes

or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by The Township.

END OF SECTION 101419

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## **SECTION 104413 - FIRE PROTECTION CABINETS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Fire-protection cabinets for the following:
    - a. Portable fire extinguishers located in Building A, Administration Suite only.  
All other fire extinguishers to be bracket mounted.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Samples: For each type of exposed finish required.
- C. Samples for Initial Selection: For each type of exposed finish required.
- D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

#### **1.5 COORDINATION**

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

- B. Coordinate sizes and locations of fire protection cabinets with wall depths.

## 1.6 SEQUENCING

- A. Apply decals or vinyl lettering on field-painted fire-protection cabinets after painting is complete.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

### 2.2 FIRE PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. J. L. Industries, Inc.;
    - b. Larsen's Manufacturing Company;
    - c. Potter Roemer LLC;
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Cold-rolled steel sheet.
  - 1. Shelf: Same metal and finish as cabinet.
- D. Cabinet Mounting:
  - 1. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame with exposed trim face and wall return at outer edge (backbend).
    - a. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
    - b. Locations: All wood stud and gypsum drywall locations.
  - 2. Surface Cabinet: One-piece combination trim and perimeter door frame.
    - a. Locations: All other applications.
- E. Cabinet Trim Material: Same material and finish as door.

- F. Door Material: Steel sheet.
- G. Door Style: Full acrylic bubble with frame.
- H. Door Glazing: Molded acrylic bubble.
  - 1. Acrylic Bubble Color: Clear transparent.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide projecting door pull and friction latch.
  - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Accessories:
  - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
  - 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
    - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
      - 1) Location: Applied to location indicated on Drawings.
      - 2) Application Process: Silk-screened.
      - 3) Lettering Color: As indicated.
      - 4) Orientation: As indicated on Drawings.
- K. Materials:
  - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
    - a. Finish: Baked enamel or powder coat.
    - b. Color: As selected by The Architect from full range of industry colors and color densities.

## 2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
  - 1. Weld joints and grind smooth.
  - 2. Provide factory-drilled mounting holes.
  - 3. Prepare doors and frames to receive locks.

4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
  1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
  2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
- D. Fire Blanket and Fire Blanket Cabinet.
- E. Steel fabricator shall be AISC-Certified.

## 2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated on drawings or, if not indicated, at heights in compliance with ICC A117.1.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.



- C. Identification: Apply decals or vinyl lettering at locations indicated.

### 3.3 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

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## **SECTION 104416 - FIRE EXTINGUISHERS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

#### **1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
    - a. Schedules and coordination requirements.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Warranty: Sample of special warranty.

#### **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

## 1.7 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10.
    - b. Faulty operation of valves or release levers.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

### 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Extinguishers are to be the type and size recommended by NFPA 10, Portable Fire Extinguishers. Fire extinguishers shall bear the label of UL or FM, as required by the Client Agency's insurance provider.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Amerex Corporation.
    - b. Ansul Incorporated; Tyco International Ltd.
    - c. Badger Fire Protection; a Kidde company.
    - d. Buckeye Fire Equipment Company.
    - e. Fire End & Croker Corporation.
    - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
    - g. Larsen's Manufacturing Company.
    - h. Potter Roemer LLC.

2. Valves: Manufacturer's standard.
  3. Handles and Levers: Manufacturer's standard.
  4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. ABC Dry-Chemical Type in Steel Container: UL-rated 2-A:00-B:C, 10-lb nominal capacity, with mono-ammonium phosphate-based dry chemical in enameled-steel container.
1. Locations: All areas not indicated in paragraphs C and D below.
- C. Carbon Dioxide Type in Steel Container: UL-rated 10-B:C, 10-lb nominal capacity, with carbon dioxide chemical in enameled-steel container.
1. Locations: Electrical Areas.
- D. ABC Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with mono-ammonium phosphate-based dry chemical in enameled-steel container.
1. Locations: Mechanical Areas.
- E. Extinguishers are to be the type and size recommended by NFPA 10, Portable Fire Extinguishers. Fire extinguishers shall bear the label of UL or FM.

## 2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Amerex Corporation.
    - b. Ansul Incorporated; Tyco International Ltd.
    - c. Badger Fire Protection; a Kidde company.
    - d. Buckeye Fire Equipment Company.
    - e. Fire End & Croker Corporation.
    - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
    - g. Larsen's Manufacturing Company.
    - h. Potter Roemer LLC.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
  - a. Orientation: As indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
  1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
  1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

## **SECTION 105000 – METAL LOCKERS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section includes:
  - 1. Metal locker units, of types specified, with hinged doors.
  - 2. Metal fillers, and end finishing panels.
  - 3. Hooks, latches, and hardware.
  - 4. Attachment hardware.
  - 5. Locker room benches and pedestals.
- B. Related Sections
  - 1. Division 4 Section – Unit Masonry for base.
  - 2. Division 6 Section - Miscellaneous Carpentry for wood blocking.

#### **1.3 REFERENCES**

- A. American National Standards Institute (ANSI) Standards: Applicable standards for fasteners used for assembly.
- B. American Society for Testing and Materials (ASTM) Standards:
  - 1. Applicable standards for steel sheet materials used for fabrication.
  - 2. Applicable standards for the testing of electrostatically applied Powder Coat Paint
- C. American Institute of Steel Construction (AISC) Standards: Applicable standards for steel materials used for fabrication.
- D. ICC A117 for accessibility requirements and quantities.

#### **1.4 INSPECTION REQUIREMENTS**

- A. The following list of minimal compliance standards are to be inspected and brought into compliance by the Contractor during construction. Discovery and correction of non-complying work is the responsibility of the Contractor. The Contractor shall identify and correct all non-complying items prior to requesting the processing of the Certificate of Substantial Completion.

- B. Complying metal lockers work shall be capable of withstanding dead and live loads under normal use.
- C. Non-complying work includes but is not limited to the following:
  - 1. Bent, scratched or damaged metal lockers.
  - 2. Lockers loose from wall base anchorages.
  - 3. Loose stove bolts.
  - 4. Lockers with missing hardware.

#### 1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of metal locker required. Include data substantiating that products to be furnished comply with requirements of the contract documents.
- B. Shop Drawings: Prior to fabrication and delivery, submit shop drawings clearly indicating:
  - 1. Locker types, sizes, configurations, layout of groups of lockers, trim and fillers, accessories, installation details, color and finish, and numbering.
  - 2. Installation details at non-standard conditions, if any.
  - 3. Provide installation schedule and procedures to ensure proper installation.
- C. Samples: For selection, submit two copies of manufacturer's "Color Charts", including standard colors for color selection by The Architect.
- D. Maintenance Data: Provide written documentation of the manufacturer's statement, claiming the maintenance free nature of the product.
- E. Warranty: Submit draft copy of proposed warranty for review by The Architect.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engage an experienced manufacturer who is ISO 9001:2008 certified for the design, production, installation and service of metal lockers. Furnish certification attesting ISO 9001:2008 quality system registration.
- B. Minimum Qualifications: 1-year experience installing metal lockers of comparable size and complexity to specified project requirements.

#### 1.7 PROTECTION

- A. Protect locker finishes and adjacent surfaces and materials from damage or marring during installation.



## 1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify quantities of metal locker units before fabrication. Indicate verified measurements on shop drawings. Coordinate fabrication and delivery to ensure no delay in progress of the work.

## 1.9 WARRANTY

- A. Provide a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace units, which fail in materials or workmanship within the established warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have under General Condition's provision of the contract documents.
- B. Limited Lifetime Warranty: Subject to the terms in the written warranty, warrant the original purchaser exclusively that the locker frames manufactured by it will be free from defects in materials and workmanship for the lifetime of the locker.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Lyon Metal Products, Aurora, IL.
  - 2. Penco Products, Inc.
  - 3. Republic Storage Systems Company, Inc., Canton, OH.

### 2.2 MATERIALS

- A. Provide materials and quality of workmanship, which meets or exceeds established industry standards for products specified. Use furniture grade sheet metal and fasteners for component fabrication unless indicated otherwise. Material thicknesses/gauges are manufacturer's option unless indicated otherwise.

### 2.3 LOCKER TYPES

- A. Standard welded metal lockers with flat top
  - 1. Size:
    - a. 24"W x 18"D x 84"H.

## 2.4 MANUFACTURED COMPONENTS

### A. Welded Frame:

1. The welded frame must consist of top, bottom, back, and sides constructed of a minimum of 18-gauge steel. All frame components shall be joined using resistance welding.
2. Locks:
  - a. Locks shall be centered vertically in door.
    - 1) ADA lockers must have locks / handles below 48" AFF.
  - b. Locking option:
    - 1) Hasp Lock.
3. Doors to remain closed when in unlocked mode.

### B. Accessory Components

1. All interior components must be specified at the time of order.
  - a. Shelf with Coat Rod.
  - b. Single Coat Hook.
  - c. ADA lockers to have fixed shelf at least 15" AFF.

## 2.5 LOCKER ACCESSORIES

- A. End Finishing Panels: One piece, 16 gage sheet steel, provide for exposed end of locker runs, single or double row type as required, concealed fastenings where possible, and finish to match lockers.
- B. Trim and Fillers: Provide manufacturer's standard between ends of lockers and wall and at corners; provide matching fillers and closures on all four locker edges as required.
- C. Locker Tag Numbers: Provide per customer requirement.

## 2.6 ACCESSIBLE LOCKERS

- A. Provide a quantity of lockers equal to 5% of the total locker count in each area, but not less than 1, for accessible use. Each accessible locker must be labeled as such with ADA signage per Code.
- B. Provide not less than 1 shelf located no higher than 48" above the floor for forward approach and 54" above the floor for side approach.
- C. Provide 1 shelf located at the bottom of the locker no lower than 15" above the floor for forward reach.

- D. Provide hardware that does not require tight grasping, pinching, or twisting of the wrist, and that operates with a force of not more than 5 lbs per foot.

## 2.7 FABRICATION

- A. General: Coordinate fabrication and delivery to ensure no delay in progress of the work.

## 2.8 FABRICATION - BENCHES AND PEDESTALS

- A. Locker Room Benches: Maple: 1-1/4-inch thick full finished thickness x 1'-6" wide or 1'-8" wide for ADA (dimensional information provided on Accessible Bench Detail Drawing) wide supported by three steel pedestals per 8-ft. of length shown.
- B. Permanent Pedestals (6-ft. o.c. maximum): 1-5/8-inch minimum O.D. steel tubing, with 14 gage Steel pedestal flanges welded to each end. Anchor to floor using two Hilti 5/16-inch diameter Kwik Bolt II expansion anchors drilled 2-inches into concrete. Set bolt in anchors using epoxy adhesive to lock threads to anchor.

## 2.9 FINISHES

- A. Lockers:
  - 1. Thoroughly clean, degrease and neutralize, follow with a bonding and rust inhibitive phosphate treatment, and then electrostatically spray with a heavy coat of high quality enamel.
  - 2. Enamel finish shall be baked at 300 degrees and must withstand a rigid hammer test without chipping or flaking.
  - 3. Colors: To be selected by The Architect from manufacturer's standard available colors.
- B. Locker Room Benches:
  - 1. Finish maple benches with manufacturer's standard clear finish (three coat glossy) for protection against moisture and abrasion.
  - 2. Bench Pedestals: Paint finish in same color as lockers.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Take actual site dimensions affecting this work.

- B. Confirm that constructed bases are properly sized and located, and embedded wood sleeper strip(s) is installed; one sleeper for single row wall attached lockers and two sleepers for single and double row island grouped lockers.

### 3.2 INSTALLATION

- A. Install lockers in groups as indicated, and in accordance with manufacturer's printed installation instruction and recommended procedures.
- B. Install lockers plumb, square, and in line. Set on prepared masonry bases provided.
- C. Anchor lockers to wall and base with appropriate anchor devices.
  - 1. Minimum Pullout Force: 100 lbs.
- D. Bolt adjoining locker units together to provide rigid installation.
- E. Install metal end finishing panels and filler panels to close off openings.
- F. Install permanent pedestal mounted locker benches at locations indicated, and in accordance with manufacture's installation instructions.
- G. Replace components that do not operate smoothly.

END OF SECTION 105000

## **SECTION 123216 - MANUFACTURED PLASTIC-LAMINATE-FACED CASEWORK**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes:
  - 1. Plastic-laminate-faced cabinets and countertops.
  - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.
- B. Related Sections:
  - 1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
  - 2. Section 066510 "Solid Surface Fabrications."

#### **1.3 DEFINITIONS**

- A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.

#### **1.4 PREINSTALLATION MEETINGS**

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

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show fabrication details, including types and locations of hardware. Show installation details, including field joints and filler panels. Indicate manufacturer's catalog numbers for casework.

- C. Samples: For cabinet finishes.
- D. Samples for Initial Selection: For cabinet finishes.
  - 1. Samples for Verification: 8-by-10-inch Samples for each type of finish.
  - 2. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- C. Sample Warranty: For special warranty.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project and who is a certified participant in AWI's Quality Certification Program.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

#### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period. Maintain temperature and relative humidity during the remainder of the construction period in range recommended for Project location by the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

- C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Delamination of components or other failures of glue bond.
    - b. Warping of components.
    - c. Failure of operating hardware.
  - 2. Warranty Period: One year from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cal-Dak Cabinets.
  - 2. CampbellRhea.
  - 3. R. C. Smith Company.
  - 4. Sidney Millwork Company.
  - 5. Stevens Industries, Inc.
  - 6. Techline USA, LLC.
  - 7. Terrill Manufacturing Co. Inc.
  - 8. TMI Systems Design Corporation.
- B. Source Limitations: Obtain plastic-laminate-faced cabinets from single manufacturer.

#### 2.2 CASEWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.
  - 1. Grade: Custom.
  - 2. Provide labels and certificates from AWI certification program indicating that casework, including installation, complies with requirements of grades specified.

- B. Product Designations: Drawings indicate configurations of manufactured plastic-laminate-faced cabinets by referencing designations of Casework Design Series numbering system in Appendix A of the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

## 2.3 CASEWORK

A. Design:

1. Flush overlay.

B. Grain Direction for Wood Grain Plastic Laminate:

1. Vertical on both doors and drawer fronts.
2. Lengthwise on face frame members.
3. Vertical on end panels.
4. Side to side on bottoms and tops of units.
5. Vertical on knee-space panels.
6. Horizontal on aprons.

C. Exposed Materials:

1. Plastic Laminate: Grade VGS.
  - a. Colors and Patterns: As selected by Architect from manufacturer's full range.
2. Unless otherwise indicated, provide specified edge banding on all exposed edges.
3. Solid Wood: Clear hardwood lumber of species indicated, selected for compatible grain and color.
4. Wood Species: As selected by Architect.

D. Semi-exposed Materials:

1. Plastic Laminate: Grade VGS unless otherwise indicated. Provide plastic laminate for semi-exposed surfaces unless otherwise indicated.
  - a. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.
2. Unless otherwise indicated, provide specified edge-banding on all semi-exposed edges.

E. Concealed Materials:

1. Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.



2. Plywood: Hardwood plywood.
3. Plastic Laminate: Grade BKL.
4. Particleboard.
5. MDF.

## 2.4 MATERIALS

- A. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
- B. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.
- C. Softwood Plywood: DOC PS 1.
- D. Particleboard: ANSI A208.1, Grade M-2.
- E. MDF: ANSI A208.2, Grade 130.
- F. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ABET Inc.
    - b. Arborite; a division of ITW Canada.
    - c. Formica Corporation.
    - d. Lamin-Art, Inc.
    - e. Nevamar.
    - f. Panolam Industries International Inc.
    - g. Wilsonart International.
- G. Edge-banding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick elsewhere.

## 2.5 COLORS AND FINISHES

- A. Colors and Finishes:
  1. See Finish Schedule on drawings.
- B. PVC Edgebanding Color: As selected from casework manufacturer's full range.

## 2.6 CASEWORK HARDWARE AND ACCESSORIES

- A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.
  - 1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
- B. Butt Hinges: Stainless-steel, semi-concealed, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two hinges for doors less than 48 inches high, and provide three hinges for doors more than 48 inches high. 270 degree door swing.
- C. Pulls: See Finish Schedule on drawings for types.
- D. Door Catches: Dual, self-aligning, permanent magnet catch. Provide two catches on doors more than 48 inches high.
- E. Drawer Slides: BHMA A156.9, Type B05091.
  - 1. Heavy Duty (Grade 1HD-100): Side mounted; full-extension type; zinc-plated, steel ball-bearing slides.
- F. Drawer and Hinged Door Locks: Type as selected, five-pin tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1.
  - 1. Provide a minimum of two keys per lock and six master keys.
  - 2. Provide door locks for all casework.
- G. Adjustable Shelf Supports: Mortise-type, powder-coated steel standards and shelf rests complying with BHMA A156.9, Types B04071 and B04091.
- H. Grommets for Cable Passage: 1-1/4-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

## 2.7 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesive for Bonding Plastic Laminate: Contact cement.
  - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

## 2.8 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
  - 2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 CASEWORK INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install casework level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, framing, wood

blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

- E. Fasten cabinets to adjacent cabinets and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
- F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- G. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

### 3.3 CLEANING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 123216

## **SECTION 133419 - METAL BUILDING 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 metal building systems that consist of integrated sets of mutually dependent components including structural framing, roof panels, wall panels, doors and accessories.
- B. Related Sections include the following:
  - 1. Division 3 Section "Cast-in-Place Concrete" for concrete foundations, slabs, and anchor-bolt installation.
  - 2. Division 4 Section "Unit Masonry Assemblies" for interior and exterior walls fabricated from concrete masonry units.
  - 3. Division 6 Section "Interior Finish Carpentry" for interior plywood panels.
  - 4. Division 7 Section "Building Insulation" for insulation installed in metal roof and wall panel assemblies.
  - 5. Division 7 Section "Metal Roof Panels" for factory-formed metal roof panels.
  - 6. Division 7 Section "Metal Wall Panels" for factory-formed metal wall panels.
  - 7. Division 8 Section "HM Doors and Frames."
  - 8. Division 8 Section "Sectional Overhead Doors."
  - 9. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
  - 10. Division 8 Section "Glazing" for materials and installation requirements for glazing lites in overhead doors specified in this Section.
  - 11. Division 8 Section "Operable Wall Louvers" for metal louvers.
  - 12. Division 9 painting Sections for finish painting of shop-primed structural framing.

#### **1.3 DEFINITIONS**

- A. Bay: Dimension between main frames measured normal to frame (at centerline of frame) for interior bays, and dimension from centerline of first interior main frame measured normal to end wall (outside face of end-wall girt) for end bays.
- B. Building Length: Dimension of the building measured perpendicular to main framing from end wall to end wall (outside face of girt to outside face of girt).

- C. Building Width: Dimension of the building measured parallel to main framing from sidewall to sidewall (outside face of girt to outside face of girt).
- D. Clear Span: Distance between supports of beams, girders, or trusses (measured from lowest level of connecting area of a column and a rafter frame or knee).
- E. Eave Height: Vertical dimension from finished floor to eave (the line along the sidewall formed by intersection of the planes of the roof and wall).
- F. Clear Height under Structure: Vertical dimension from finished floor to lowest point of any part of primary or secondary structure, not including crane supports, located within clear span.
- G. Terminology Standard: Refer to MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards

#### 1.4 SYSTEM DESCRIPTION

- A. General: Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include primary and secondary framing, metal roof panels, metal wall panels, and accessories complying with requirements indicated.
  - 1. Provide metal building system of size and with spacings, slopes, and spans indicated.
- B. Primary Frame Type:
  - 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.
- D. Secondary Frame Type: Manufacturer's standard purlins and joists and bypass girts.
- E. Eave Height: As indicated on Drawings.
- F. Bay Spacing: Varies, as indicated on Drawings.
- G. Roof Slope: Varies, as indicated on drawings
- H. Roof System: Manufacturer's standard vertical-rib, standing-seam metal roof panels with insulation.

- I. Exterior Wall System: Manufacturer's standard field-assembled, insulated metal wall panels.

## 1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  1. Engineer metal building systems according to procedures in MBMA's "Metal Building Systems Manual."
  2. Design Loads: Live, Wind, Snow and Seismic loads as indicated on Drawings, and further determined in accordance with ASCE 7-16, "Minimum Design Loads for Buildings and Other Structures" and by the 2018 International Building Code.
  3. Live Loads: Include vertical loads induced by the building occupancy indicated on Drawings. Include loads induced by maintenance workers, materials, and equipment for roof live loads.
    - a. Building Occupancy: As indicated on Drawings.
  4. Collateral Loads: Include additional dead loads other than the weight of metal building system for permanent items such as sprinklers, mechanical systems, electrical systems, and ceilings.
  5. Auxiliary Loads: Include dynamic live loads, such as those generated by cranes and materials-handling equipment indicated on Drawings.
  6. Load Combinations: Design metal building systems to withstand the most critical effects of load factors and load combinations as required by MBMA's "Metal Building Systems Manual", ASCE 7-16, "Minimum Design Loads for Buildings and Other Structures" and by the 2018 International Building Code.
  7. Deflection Limits: Engineer assemblies to withstand design loads with deflections no greater than the following:
    - a. Main Building Frames:
      - 1) Building A: Horizontal deflection of  $H/200$  of the height.
      - 2) Building B: Horizontal deflection of  $H/120$  of the height.
    - b. Purlins and Rafters: Vertical deflection of  $L/180$  of the span.
    - c. Girts:
      - 1) Building A (between grid lines 1 and 3, see 2/A101): Horizontal deflection of  $L/400$  of the span.
      - 2) All other locations: Horizontal deflection of  $L/240$  of the span.
    - d. Metal Roof Panels: Vertical deflection of  $L/60$  of the span.
    - e. Metal Wall Panels: Horizontal deflection of  $L/180$  of the span.

8. Design secondary framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.
  9. Provide metal panel assemblies capable of withstanding the effects of loads and stresses indicated, based on testing according to ASTM E 1592.
- B. Seismic Performance: Design and engineer metal building systems capable of withstanding the effects of earthquake motions determined by the 2018 International Building Code and in accordance with Seismic Load parameters indicated on the Drawings.
- C. Thermal Movements: Provide metal panel systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F ambient; 180 deg F , material surfaces.
- D. Thermal Performance: Provide insulated metal panel assemblies with the following maximum U-factors and minimum R-values for opaque elements when tested according to ASTM C 1363 or ASTM C 518:
1. Metal Roof Panel Assemblies:
    - a. U-Factor: .0334.
    - b. R-Value: R-30.
  2. Metal Wall Panel Assemblies:
    - a. U-Factor: .0526.
    - b. R-Value: R-19.
- E. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at negative test-pressure difference of 1.57 lbf/sq. ft..
- F. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at static-air-pressure difference of 6.24 lbf/sq. ft..
- G. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 2.86 lbf/sq. ft..
- H. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft..



- I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

## 1.6 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of the following metal building system components:
  1. Structural-framing system.
  2. Metal roof panels.
  3. Metal wall panels and metal liner panels.
  4. Insulation and vapor retarders.
  5. Flashing and trim.
  6. Doors.
  7. Accessories.
- B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other work.
  1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  2. Anchor-Bolt Plans: Submit anchor-bolt plans before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
  3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
  4. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
    - a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, snow guards, and items mounted on roof curbs.
    - b. Show wall-mounted items including doors, windows, louvers, and lighting fixtures.
  5. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:8):

- a. Flashing and trim.
  - b. Gutters.
  - c. Downspouts.
  - d. Roof ventilators.
  - e. Louvers.
- C. Samples for Initial Selection: For each type of building component with factory-applied color finish.
- D. Product Certificates: For each type of metal building system, signed by product manufacturer.
  - 1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
    - a. Name and location of Project.
    - b. Order number.
    - c. Name of manufacturer.
    - d. Name of Contractor.
    - e. Building dimensions including width, length, height, and roof slope.
    - f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
    - g. Governing building code and year of edition.
    - h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
    - i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
    - j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
- E. Welding certificates.
- F. Manufacturer Certificate: Signed by manufacturer certifying that products comply with requirements.
- G. Qualification Data: For Erector, manufacturer, and professional engineer.
- H. Material Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
  - 1. Structural steel including chemical and physical properties.
  - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
  - 4. Shop primers.
  - 5. Non-shrink grout.
- I. Source quality-control test reports.

- J. Field quality-control test reports.
- K. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for insulation and vapor retarders. Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.
- L. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.
- M. Maintenance Data: For metal panel finishes and door hardware to include in maintenance manuals.
- N. Warranties: Special warranties specified in this Section.
- O. Other Action Submittals:
  - 1. Door Schedule: For doors and frames. Use same designations indicated on Drawings. Include details of reinforcement.
    - a. Door Hardware Schedule: Include details of fabrication and assembly of door hardware. Organize schedule into door hardware sets indicating complete designations of every item required for each door or opening.
    - b. Keying Schedule: Detail Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

## 1.7 QUALITY ASSURANCE

- A. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- B. Manufacturer Qualifications: A qualified manufacturer and member of MBMA:
  - 1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- C. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.
- D. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- E. Source Limitations: Obtain primary metal building system components, including structural framing and metal panel assemblies, through one source from a single manufacturer.

- F. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal building system and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- H. Cold-Formed Steel: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members," or AISI's "Load and Resistance Factor Design Specification for Steel Structural Members," for design requirements and allowable stresses.
- I. Fire-Resistance Ratings: Where indicated, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Combustion Characteristics: ASTM E 136.
  2. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
  3. Metal panels shall be identified with appropriate markings of applicable testing and inspecting agency.
- J. Surface-Burning Characteristics: Provide field-insulated metal panels having thermal insulation and vapor-retarder-facing materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Flame-Spread Index: 25 or less, unless otherwise indicated.
  2. Smoke-Developed Index: 450 or less, unless otherwise indicated.
- K. Pre-Erection Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to metal building systems including, but not limited to, the following:
1. Inspect and discuss condition of foundations and other preparatory work performed by other trades.
  2. Review structural load limitations.
  3. Review and finalize construction schedule and verify availability of materials, Erector's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Review required testing, inspecting, and certifying procedures.
  5. Review weather and forecasted weather conditions and procedures for unfavorable conditions.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness and with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect foam-plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## 1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements:
  - 1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
  - 2. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

## 1.10 COORDINATION

- A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

- B. Coordinate installation of equipment supports and roof penetrations, which are specified in Division 07 Section "Roof Accessories."
- C. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.11 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. 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.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam, metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
  - 1. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 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 - Metallic Building Systems as basis of design or approved equivalent:
  - 1. Ceko Building Systems; Division of Robertson-Ceko Corporation.
  - 2. Heritage Building Systems.
  - 3. Star Building Systems.
  - 4. Robertson Building Systems.
  - 5. Vulcan Steel Structures, Inc.

### 2.2 STRUCTURAL-FRAMING MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.

- B. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
- E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
- F. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or High-Strength Low Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480).
- G. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 (230 through 550) or High-Strength Low Alloy Steel (HSLAS), Grades 50 through 80 (340 through 550); with G60 (Z180) coating designation; mill phosphatized.
- H. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts; ASTM A 563 (ASTM A 563M) carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
  - 1. Finish: Plain.
- I. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
  - 1. Finish: Plain.
  - 2. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with splined ends.
    - a. Finish: Plain.
- J. Un-headed Anchor Rods: ASTM F 1554, Grade 36.
  - 1. Configuration: Straight.
  - 2. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
  - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
  - 4. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
  - 5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- K. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
  - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
  - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
  - 3. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
  - 4. Finish: Plain.

- L. Primer: SSPC-Paint 15, Type I, red oxide, or other in accordance with metal building manufacturer's standard.

## 2.3 MATERIALS FOR FIELD-ASSEMBLED METAL PANELS

- A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
  - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 (230 through 550), with G90 (Z275) coating designation.
  - 2. Surface: Embossed finish.
  - 3. Exposed Finishes: Apply the following coil coating, as specified or indicated on Drawings:
    - a. High-Performance Organic Finish (2-Coat Fluoropolymer): 2-Coat Fluoropolymer Finish with not less than 70 percent polyvinylidene fluoride resin by weight.
    - b. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored backer finish, consisting of prime coat and wash coat with a total minimum dry film thickness of 0.5 mil (0.013 mm).

## 2.4 THERMAL INSULATION FOR FIELD-ASSEMBLED METAL PANELS

- A. Metal Building Insulation: ASTM C 991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch-wide, continuous, vapor-tight edge tabs; and with a flame-spread index of 25 or less.
- B. Mineral-Fiber-Blanket Insulation: ASTM C 665, type indicated below; consisting of fibers manufactured from glass.
  - 1. Type II (blankets with nonreflective membrane covering), Category 1 (membrane is a vapor retarder), Class A (membrane-faced surface with a flame-spread index of 25 or less).
- C. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60-lb/cu. ft. minimum density, unless otherwise indicated; with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.
- D. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm when tested according to ASTM E 96, Desiccant Method.
  - 1. Composition: Aluminum foil facing, elastomeric barrier coating, fiberglass scrim reinforcement, and kraft-paper backing.
- E. Retainer Strips: 0.019-inch- thick, formed, galvanized steel or PVC retainer clips colored to match insulation facing.



- F. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

## 2.5 DOOR AND FRAME MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.
- B. Fiberglass reinforced polyester (FRP), see specification section 081613 FRP Flush Doors.

- 1. For Wash Bay locations.

## 2.6 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
  - 1. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.
  - 2. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with nylon or polypropylene washer.
  - 3. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
  - 4. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- B. 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.
- C. Plywood: See Section 062000 – Interior Finish Carpentry.
- D. Gypsum Board: Type X, of thicknesses indicated, complying with ASTM C 442/C 442M or ASTM C 36/C 36M.
- E. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- F. Metal Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
2. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

## 2.7 FABRICATION, GENERAL

- A. General: Design components and field connections required for erection to permit easy assembly.
  1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
  2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances."
- C. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
  1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

## 2.8 STRUCTURAL FRAMING

- A. General:
  1. Primary Framing: Shop fabricate framing components to indicated size and section with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
    - a. Make shop connections by welding or by using high-strength bolts.
    - b. Join flanges to webs of built-up members by a continuous submerged arc-welding process.
    - c. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
    - d. Weld clips to frames for attaching secondary framing members.

- e. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary structural members with specified primer after fabrication.
- 2. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
  - a. Make shop connections by welding or by using non-high-strength bolts.
  - b. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary structural members with specified primer after fabrication.
- B. Primary Framing: Manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
  - 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
    - a. Slight variations in span and spacing may be acceptable if necessary to meet manufacturer's standard, as approved by Architect.
  - 2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
  - 3. Frame Configuration: As indicated on Drawings.
  - 4. Exterior Column Type: Tapered.
  - 5. Rafter Type: Tapered.
- C. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
  - 1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes or shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0598 inch (1.5 mm).
  - 2. End-Wall Rafters: I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
- D. Secondary Framing: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet prepainted with coil coating, unless otherwise indicated, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from minimum 0.0598-inch- thick steel sheet, built-up steel plates, or structural-steel shapes; minimum 2-1/2-inch- wide flanges.
    - a. Depth: As required to comply with system performance requirements.
  2. Girts: C- or Z-shaped sections; fabricated from minimum 0.0598-inch- thick steel sheet, built-up steel plates, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees to flange and with minimum 2-1/2-inch- wide flanges.
    - a. Depth: As required to comply with system performance requirements.
  3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from 0.0598-inch-thick steel sheet, built-up steel plates, or structural-steel shapes; to provide adequate backup for metal panels.
  4. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch (25-mm) diameter, cold-formed structural tubing to stiffen primary frame flanges.
  5. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
  6. Base or Sill Angles: Minimum 3-by-2-by-0.0598-inch zinc-coated (galvanized) steel sheet.
  7. Purlin and Girt Clips: Minimum 0.0598-inch- thick, steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
  8. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0598-inch- thick material.
  9. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch-thick, cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.
  10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- E. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads, fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly. Provide canopy framing assemblies in accordance with the information and details indicated on the Drawings.
- F. Bracing: Provide lateral bracing as required to support design loads. Design lateral load resisting system to include the effects of both wind and seismic loads. Methods of lateral bracing can be any of the methods specified below:
1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50 ; minimum 1/2-inch-diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
  2. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.

3. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
  4. Fixed-Base Columns: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
  5. Diaphragm Action of Metal Panels: Design metal building to resist lateral load forces through diaphragm action of metal panels.
- G. Bolts: Provide plain finish bolts for structural-framing components that are primed or finish painted.
- H. Factory-Primed Finish: Apply specified primer immediately after cleaning and pretreating.
1. Prime primary, secondary, and end-wall structural-framing members to a minimum dry film thickness of 1 mil .
    - a. Prime secondary steel framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.
  2. Prime galvanized members with specified primer, after phosphoric acid pretreatment.

## 2.9 METAL ROOF PANELS

- A. Factory Roll-Formed Metal Roof Panels: Basis of Design – Lokseam.
1. Material: Aluminum-zinc alloy-coated steel sheet, 24 gauge thick.
    - a. Exterior Finish: Fluoropolymer.
    - b. Color: As selected by Architect from manufacturer's full range.
  2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from aluminum-zinc alloy-coated steel sheet.
  3. Joint Type: Mechanically seamed, folded as standard with manufacturer.
  4. Panel Coverage: 16 inches .
  5. Panel Height: 1 3/4 inches.
  6. Uplift Rating: UL 90.

## 2.10 METAL WALL PANELS

- A. Concealed-Fastener Insulated Metal Wall Panels: Basis of Design – FW-120 Panel.
1. Material: Zinc-coated(galvanized) steel sheet, 24 gauge thick.
    - a. Exterior Finish: Fluoropolymer.
    - b. Color: As selected by Architect from manufacturer's full range.

2. Panel Coverage: 12 inches, no beads.
3. Panel Height: See drawings.

## 2.11 DOORS AND FRAMES

- A. Coordinate Doors and Frames with Division 08.

## 2.12 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
  1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels, unless otherwise indicated.
  1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
  2. Clips: Manufacturer's standard, formed from stainless-steel sheet, designed to withstand negative-load requirements.
  3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from stainless-steel sheet or nylon-coated aluminum sheet.
  4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
  6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1 inch (25 mm) standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
  1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Formed from minimum 0.0159-inch- (0.40-mm-) thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
  2. Opening Trim: Minimum 0.0159-inch- (0.40-mm-) thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Gutters: Formed from minimum 0.0159-inch- (0.40-mm-) thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
1. Gutter Supports: Fabricated from same material and finish as gutters; spaced 36 inches (900 mm) o.c.
  2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Formed from 0.0159-inch- (0.4-mm-) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- (3-m-) long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters; spaced 10 feet (3 m) o.c.
- G. Roof Ventilators: Gravity type, complete with hardware, flashing, closures, and fittings.
1. See Division 23 requirements.
- H. Louvers: Size and design indicated; self-framing and self-flashing. Fabricate welded frames from minimum 0.0428-inch- (1.1-mm-) thick, metallic-coated steel sheet; finished to match metal wall panels. Form blades from 0.0329-inch- (0.85-mm-) thick, metallic-coated steel sheet; folded or beaded at edges, set at an angle that excludes driving rains, and secured to frames by riveting or welding. Fabricate louvers with equal blade spacing to produce uniform appearance.
1. Blades: See Division 23 requirements.
  2. Free Area: See Division 23 requirements.
  3. Bird Screening: See Division 23 requirements.
  4. Vertical Mullions: See Division 23 requirements.

- I. Roof Curbs: Fabricated from minimum 0.0428-inch- (1.1-mm-) thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal roof panels; with welded top box and bottom skirt, and integral full-length cricket; capable of withstanding indicated loads and of size and height indicated.
  - 1. Curb Subframing: Minimum 0.0528-inch- (1.35-mm-) thick, angle-, C-, or Z-shaped steel sheet.
  - 2. Insulation: 1-inch- (25-mm-) thick, rigid type.
- J. Snow Guards: Prefabricated, noncorrosive units designed to be installed without penetrating roof panel, with predrilled holes and clamps or hooks for anchoring.
  - 1. Metal-Type Guard: 2-Pipe system consisting of aluminum or stainless-steel rods or bars held in place by supports clamped to vertical ribs of standing-seam roof.
    - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - b. Products: Subject to compliance with requirements, provide one of the following:
      - 1) LMCurbs; S-5! SnoFence.
      - 2) Riddell & Company, Inc.; Snobar.
      - 3) Snow Management Systems; Vermont Snowguard.
- K. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

## 2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.14 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform the following tests and inspections and to submit reports.
- B. Tests and Inspections:



1. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  2. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1 and the following inspection procedures, at inspector's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
- C. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  1. For the record, prepare written report, endorsed by Erector, listing conditions detrimental to performance of work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with Erector present, for compliance with requirements and metal building system manufacturer's tolerances.
  1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place, unless otherwise indicated.

### 3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing true to line, level, plumb, rigid, and secure. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist cure grout for not less than seven days after placement.
  - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
    - a. Joint Type: Snug tightened or pretensioned.
- G. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts.
  - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.

2. Locate and space wall girts to suit openings such as doors and windows.
  3. Locate canopy framing as indicated.
  4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Steel Joists and Joist Girders: Install joists, girders, and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders," joist manufacturer's written recommendations, and requirements in this Section.
1. Before installation, splice joists delivered to Project site in more than one piece.
  2. Space, adjust, and align joists accurately in location before permanently fastening.
  3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
  4. Bolt joists to supporting steel framework using carbon-steel bolts, unless otherwise indicated.
  5. Bolt joists to supporting steel framework using high-strength structural bolts, unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
  6. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.
- I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
  2. Locate interior end-bay bracing only where indicated.
- J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- K. Erection Tolerances: Maintain MBMA erection tolerances for framing.

### 3.4 METAL PANEL INSTALLATION, GENERAL

- A. Examination: Examine primary and secondary framing to verify that structural panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
1. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before metal panel installation.
- B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
    - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
  2. Install metal panels perpendicular to structural supports, unless otherwise indicated.
  3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.
  5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- C. Lap-Seam Metal Panels: Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or metal panels. Install screws in predrilled holes.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal panel manufacturer.
  2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- ### 3.5 METAL ROOF PANEL INSTALLATION
- A. General: Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations.
1. Install ridge caps as metal roof panel work proceeds.

2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Field-Assembled, Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
1. Install clips to supports with self-tapping fasteners.
  2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
  4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
  5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels for fasteners.
  6. Provide metal closures at each side of ridge caps.
- C. Field-Assembled, Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal roof panels.
  2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
  3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels; on side laps of ribbed or fluted metal panels; and elsewhere as needed to make metal panels weatherproof to driving rains.
  4. At metal panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- E. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

### 3.6 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless

otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
  2. Shim or otherwise plumb substrates receiving metal wall panels.
  3. When two rows of metal panels are required, lap panels 4 inches (102 mm) minimum.
  4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
  5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
  6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
  7. Install screw fasteners in predrilled holes.
  8. Install flashing and trim as metal wall panel work proceeds.
  9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated, or if not indicated, as necessary for waterproofing.
  10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws.
  11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Field-Assembled, Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.
1. Field-Insulated Assemblies: Install thermal insulation as specified. Install metal liner panels over insulation on interior side of girts at locations indicated. Fasten with exposed fasteners as recommended by manufacturer.
- C. Factory-Assembled, Insulated Metal Wall Panels: Install insulated metal wall panels on exterior side of girts. Attach panels to supports at each panel joint with concealed clip and fasteners at maximum 42 inches (1067 mm) o.c., but spaced not more than as recommended by manufacturer. Fully engage tongue and groove of adjacent insulated metal wall panels.
1. Install clips to supports with self-tapping fasteners.
  2. Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.
- D. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), noncumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

### 3.7 THERMAL INSULATION INSTALLATION FOR FIELD-ASSEMBLED METAL PANELS

- A. General: Install insulation concurrently with metal wall panel installation, in thickness indicated to cover entire wall, according to manufacturer's written instructions.
1. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
  2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
  3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths with both sets of facing tabs sealed to provide a complete vapor retarder.
  4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation with both sets of facing tabs sealed to provide a complete vapor retarder.
- B. Blanket Roof Insulation: Comply with the following installation method:
1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Hold in place by metal roof panels fastened to secondary framing.
  2. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder facing tabs up and over purlin, overlapping adjoining facing of next insulation course maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.
  3. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Install layer of filler insulation over first layer to fill space formed by metal roof panel standoffs. Hold in place by panels fastened to standoffs.
  4. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder facing tabs up and over purlin, overlapping adjoining facing of next insulation course maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
  5. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
  6. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
- C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Hold in place by metal wall panels fastened to secondary framing.
1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
  2. Sound-Absorption Insulation: Where sound-absorption requirement is indicated for metal liner panels, cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.

- D. Board Wall Insulation: Extend board insulation in field-assembled metal wall panel assembly in thickness indicated to cover entire wall. Comply with installation requirements in Division 7 Section "Building Insulation."
  - 1. Retain insulation in place by adhesive within integral pockets within metal wall panels, or metal clips and straps spaced at intervals recommended by insulation manufacturer to hold insulation securely in place. Maintain cavity width between insulation and metal liner panel of dimension indicated.

### 3.8 DOOR AND FRAME INSTALLATION

- A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.
- B. Personnel Doors and Frames: Install doors and frames according to ANSI A250.8. Shim as necessary to comply with DHI A115.IG. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:
  - 1. Between Doors and Frames at Jambs and Head: 1/8 inch (3 mm).
  - 2. Between Edges of Pairs of Doors: 1/8 inch (3 mm).
  - 3. At Door Sills with Threshold: 3/8 inch (9.5 mm).
  - 4. At Door Sills without Threshold: 3/4 inch (19.1 mm).
  - 5. At fire-rated openings, install frames according to, and doors with clearances specified in, NFPA 80.
- C. Sliding Service Doors: Bolt support angles to opening head members through factory-punched holes. Bolt door tracks to support angles at maximum 24 inches (610 mm) o.c. Set doors and operating equipment with necessary hardware, jamb and head mold stops, continuous hood flashing, anchors, inserts, hangers, and equipment supports.
- D. Field Glazing: Comply with installation requirements in Division 8 Section "Glazing."
- E. Door Hardware: Mount units at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 1. Install surface-mounted items after finishes have been completed on substrates involved.
  - 2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
  - 4. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealants."



### 3.9 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  2. Install components for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  3. Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet (1.2 m) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.
1. Provide elbows at base of downspouts to direct water away from building.
  2. Tie downspouts to underground drainage system indicated.
- E. Circular Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Mount ventilators on flat level base. Install preformed filler strips at base to seal ventilator to metal roof panels.

- F. Continuous Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Join sections with splice plates and end-cap skirt assemblies where required to achieve indicated length. Install preformed filler strips at base to seal ventilator to metal roof panels.
- G. Louvers: Locate and place louver units level, plumb, and at indicated alignment with adjacent work.
  - 1. 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.
  - 2. Provide perimeter reveals and openings of uniform width for sealants and joint fillers.
  - 3. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
  - 4. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.
- H. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- I. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform the following tests and inspections and to submit reports.
- B. Tests and Inspections:
  - 1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  - 2. Welded Connections: In addition to visual inspection, partial and complete joint penetration field connections shall be tested and inspected according to AWS D1.1 using one of the following inspection procedures, at inspector's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
- C. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.

### 3.11 ADJUSTING

- A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.
- B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.
  - 1. Door Closers: Adjust door closers to compensate for final operation of heating and ventilating equipment. Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (76 mm) from the latch, measured to the leading edge of the door.
- C. Roof Ventilators and Adjustable Louvers: After completing installation, including work by other trades, lubricate, test, and adjust units to operate easily, free of warp, twist, or distortion as needed to provide fully functioning units.
  - 1. Adjust louver blades to be weathertight when in closed position.

### 3.12 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, and accessories.
  - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning."
  - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.
- D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
  - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. Doors and Frames: Immediately after installation, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
  - 1. Immediately before final inspection, remove protective wrappings from doors and frames.

- F. Louvers: Clean exposed surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
  - 1. Restore louvers damaged during installation and construction period 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.
    - a. 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 133419