



# PROJECT MANUAL

VOLUME #2 of 3

**ALLEN CO-SCOTTSVILLE HS  
ATHLETIC FIELDS & FACILITIES**  
Scottsville, Kentucky

**OWNER**

Allen Co-Scottsville Board of Education  
Scottsville, Kentucky  
SUPERINTENDENT - Travis Hamby

March 2026  
SCB 2459 / BG #25-250

**ARCHITECT / CIVIL ENGINEERING & SITE DESIGN:**

SHERMAN CARTER BARNHART ARCHITECTS, PLLC  
144 Turner Commons Way, Suite 110  
Lexington, KY 40508  
(859) 224-1351

**CONSTRUCTION MANAGER:**

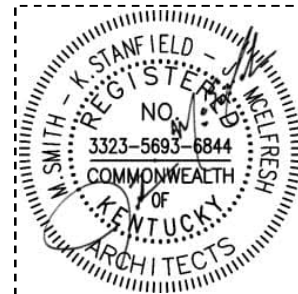
ALLIANCE CORPORATION, INC.  
116 E College St.  
Glasgow, KY 42141  
(270) 651-8848

**MECHANICAL / ELECTRICAL ENGINEER:**

SHROUT TATE WILSON CONSULTING ENGRS.  
628 Winchester Road  
Lexington, KY 40504  
(859) 277-8177

**STRUCTURAL ENGINEER:**

SHERMAN CARTER BARNHART ARCHITECTS, PLLC  
9300 Shelbyville Road  
Hurstbourne Lane, Suite 502  
Louisville, KY 40222  
(502) 721-6100



**HARDWARE CONSULTANT:**

JSC CONSULTANTS  
Jeff Clark  
4013 Saratoga Wood Drive  
Louisville, KY 40299

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**DIVISION 02 - DEMOLITION**

023200 Geotechnical Investigation and Report  
024116 Structure Demolition

**DIVISION 03 - CONCRETE**

033000 Cast-In-Place Concrete  
Attachment 1 – Concrete Mix Design Submittal Form  
Attachment 2 – Concrete Installer Qualifications Form

**DIVISION 04 - MASONRY**

040110 Masonry Cleaning  
042000 Unit Masonry  
047200 Cast Stone Masonry

**DIVISION 05 - METALS**

051200 Structural Steel Framing  
052100 Steel Joist Framing  
053100 Steel Decking  
054000 Cold-Formed Metal Framing  
054210 Engineered Light-Gage Metal Trusses  
055000 Metal Fabrications  
055116 Metal Floor Plate Stairs  
055119 Metal Grating Stairs  
055190 Post Installed Concrete Anchors  
055213 Pipe and Tube Railings  
057300 Exterior Decorative Metal Railings

**DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES**

061053	Miscellaneous Rough Carpentry
061600	Sheathing
062013	Exterior Finish Carpentry
062023	Interior Finish Carpentry
064100	Architectural Wood Casework

**DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

071113	Bituminous Damp-proofing
071900	Water Repellents
072100	Thermal Insulation
072119	Foamed-In-Place Insulation
072500	Weather Barriers
072600	Underslab Vapor Retarder
074113.16	Standing Seam Metal Roof Panels
074213.13	Formed Metal Wall Panels
075423	Thermoplastic-Polyolefin (TPO) Roofing
076200	Sheet Metal Flashing and Trim
077100	Roof Specialties
077129	Manufactured Roof Expansion Joints
077200	Roof Accessories
077253	Snow Guards
078413	Penetration Firestopping
078443	Joint Firestopping
079200	Joint Sealants
079513.13	Interior Expansion Joint Cover Assemblies

**DIVISION 08 - OPENINGS**

081113	Hollow Metal Doors and Frames
083113	Access Doors and Frames
083313	Coiling Counter Doors
083323	Overhead Coiling Doors
083226	Overhead Coiling Grilles
084113	Aluminum Framed Entrances and Storefronts
087100	Door Hardware
088000	Glazing
088300	Mirrors
089119	Fixed Louvers

**DIVISION 09 - FINISHES**

092216	Non-Structural Metal Framing
092900	Gypsum Board
093013	Ceramic Tiling
095113	Acoustical Panel Ceilings
095423	Linear Metal Ceilings
096466	Wood Flooring
096513	Resilient Base and Accessories
096516	Resilient Athletic Flooring
096519	Resilient Tile Flooring
096723	Resinous Flooring
099113	Exterior Painting
099123	Interior Painting

**DIVISION 10 - SPECIALTIES**

101100	Visual Display Units
101416	Plaques
101419	Dimensional Letter Signage
101423	Panel Signage
102600	Wall and Door Protection
102800	Toilet, Bath, and Laundry Accessories
104413	Fire Protection Cabinets
104416	Fire Extinguishers
105100	Athletic Lockers
105113	Metal Lockers
105300	Aluminum Protective Canopies and Walkway Covers
107512	Scoreboard
107529	Flagpoles

**DIVISION 11 - EQUIPMENT**

116623	Gymnasium Equipment
116643	Scoreboards

**DIVISION 12 - FURNISHINGS**

122413	Roller Window Shades
123216	Manufactured Plastic-Laminate-Faced Casework
123616	Metal Countertops
123662	Solid Surface Countertops
126313	Fixed Stadium Seating
126314	Exterior Grandstand – Bleacher Assemblies

**DIVISION 13 - SPECIAL CONSTRUCTION**

131250 Metal Building Systems  
133420 Modular Press Box

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## 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. Face brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Cavity-wall insulation.

- B. Related Sections:

1. Section 033000 "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.
2. Section 047200 "Cast Stone Masonry" for furnishing cast stone trim.
3. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
4. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
5. Section 071900 "Water Repellents" for water repellents applied to unit masonry.

#### 1.3 DEFINITIONS

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

#### 1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
  1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.

2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
  1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
- C. Samples for Initial Selection:
  1. Face brick.
  2. Colored mortar.
  3. Weep holes/vents.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
  1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
    - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
  2. Cementitious materials. Include brand, type, and name of manufacturer.
  3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  4. Grout mixes. Include description of type and proportions of ingredients.
  5. Reinforcing bars.
  6. Joint reinforcement.
  7. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
  1. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

#### 1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. 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.

- C. 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.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Build mockups for typical exterior wall in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness, including face and backup wythes and accessories.
    - a. Include a sealant-filled joint at least 16 inches (400 mm) long in exterior wall mockup.
    - b. Include CMU, sheathing, building wrap, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
    - c. Mockup to include metal panels with perimeter trim. Refer to Division 7 of Section.
  - 3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
  - 4. Protect accepted mockups from the elements with weather-resistant membrane.
  - 5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers 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.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.9 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 (600 mm) down both sides of walls and hold cover securely in place.
  - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. 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. Unit Compressive Strength: Provide Type 1, moisture controlled, units with minimum average net-area compressive strength of 1900 psi (10.34 MPa).
  - 2. Density Classification: Lightweight.
  - 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
    - a. 4 inches (100 mm) nominal; 3-5/8 inches (92 mm) actual.
    - b. 6 inches (150 mm) nominal; 5-5/8 inches (143 mm) actual.
    - c. 8 inches (200 mm) nominal; 7-5/8 inches (194 mm) actual.
    - d. 12 inches (300 mm) nominal; 11-5/8 inches (295 mm) actual.
  - 4. Shapes: Bullnose CMU shall be used at all outside corners U.N.O., refer to details for wall base conditions in contract documents.

## 2.3 CONCRETE and MASONRY LINTELS

- A. General: Provide one of the following:
- B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.
- C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.4 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
  - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
  - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
  - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: Facing brick complying with ASTM C 216.
  - 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. Field Brick – To match existing elementary school addition
    - 1) **Basis of Design: Watsontown Brick – Red Wirecut Flash**
      - a) Columbia, SC Architectural Series
  - b. Accent Brick – To match existing elementary school addition
    - 1) **Basis of Design: The Belden Brick Co. – Modular Black Diamond Velour**
      - a) 20-41R, Sugarcreek Plant 2
  - c. Or approved equal from one of the following:
    - 1) Acme Brick
    - 2) Sioux City Brick
2. Grade: SW.
  3. Type: FBS.
  4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
  5. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.
  6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
  7. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m) or shall have a history of successful use in Project's area.
  8. Size (Actual Dimensions): 3-1/2 inches (89 mm) wide by 2-1/4 inches (57 mm) high by 7-1/2 inches (190 mm) long or 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
  9. Application: Use where brick is exposed unless otherwise indicated.
  10. Color and Texture: As selected by Architect from manufacturer's full range. Refer to Section 2.4-B-1 in this specification.

## 2.5 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: ASTM C 91.
  1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Essroc, Italcementi Group; Flamingo-Brixment
    - b. Capital Materials Corporation; Flamingo Color Masonry Cement.
    - c. Holcim (US) Inc.; Mortamix Masonry Cement.
    - d. Lafarge North America Inc.; Magnolia Masonry Cement.
    - e. Lehigh Cement Company; Lehigh Masonry Cement.
- E. Mortar Cement: ASTM C 1329.
  1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Lafarge North America Inc.; Magnolia Superbond Mortar Cement.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
- 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. Davis Colors; True Tone Mortar Colors.
    - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
    - c. Solomon Colors, Inc.; SGS Mortar Colors.
- G. Colored Cement Product: Packaged blend made from portland cement and hydrated lime, masonry cement, or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
- 1. Colored Portland Cement-Lime Mix:
    - 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) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
      - 2) Holcim (US) Inc; Rainbow Mortamix Custom Color Cement/Lime.
      - 3) Lafarge North America Inc; Eaglebond Portland & Lime.
      - 4) Lehigh Hanson; HeidelbergCement Group; Lehigh Custom Color Portland/Lime Cement.
  - 2. Colored Masonry Cement:
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Capital Materials Corporation; Flamingo Color Masonry Cement.
      - 2) Cemex S.A.B. de C.V.; Richcolor Masonry Cement.
      - 3) Essroc, Italcementi Group; Brixment-in-Color.
      - 4) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
      - 5) Lafarge North America Inc.; U.S. Cement Custom Color Masonry Cement.
      - 6) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
      - 7) National Cement Company, Inc.; Coosa Masonry Cement.
  - 3. Formulate blend as required to produce color indicated or, if not indicated, as selected by Architect from manufacturer's full range of colors.
    - a. Color to match existing elementary school addition on site.
    - b. Basis of design at brick: Flamingo-Brixement C-244
- H. Aggregate for Mortar: ASTM C 144.
- 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  - 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
  - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
  - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

- I. Aggregate for Grout: ASTM C 404.
- J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
  - 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. Euclid Chemical Company (The); Accelguard 80.
    - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
    - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- K. Water: Potable.

## 2.6 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
  - 1. Interior Walls: Mill-galvanized, carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
  - 3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
  - 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
  - 5. Wire Size for Veneer Ties: 0.148-inch (3.77-mm) diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
  - 7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:
  - 1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus 1 side rod at each wythe of masonry 4 inches (100 mm) wide or less.
  - 2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.
  - 3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

## 2.7 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. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.

2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
  3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
  4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long may be used for masonry constructed from solid units.
  2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm).
  3. Wire: Fabricate from 1/4-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
  2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.05-inch-(2.66-mm-) thick, steel sheet, galvanized after fabrication.
  2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch-(6.35-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- F. Rigid Anchors: Fabricate from steel bars bent to configuration indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- G. Adjustable Masonry-Veneer Anchors:
1. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch-(4.76-mm-) diameter, hot-dip galvanized-steel wire unless otherwise indicated.
  2. Adjustable Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
    - a. Products: Basis of Design: Hohmann & Barnard, Inc. Adjustable Anchor System for Rubble Stone: Tie-HVR-195V Anchor System, Truss Type for Insulated Cavity Wall

- b. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- 1) Dayton Superior Corporation, Dur-O-Wal Division
- 2) Heckmann Building Products Inc.
- 3) Hohmann & Barnard, Inc.
- 4) Wire-Bond

## 2.8 MISCELLANEOUS ANCHORS

- A. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch (0.86-mm), galvanized steel sheet.

## 2.9 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing: Use the following unless otherwise indicated:

- 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.02 mm).

- 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) Advanced Building Products Inc.; Peel-N-Seal.
- 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
- 3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
- 4) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
- 5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
- 6) Hohmann & Barnard, Inc.; Textroflash.
- 7) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
- 8) Polyguard Products, Inc.; Polyguard 300.
- 9) Sandell Manufacturing Co., Inc.; Sando-Seal.
- 10) Williams Products, Inc.; Everlastic MF-40.

- b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.10 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.
- B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use the following unless otherwise indicated:
  - 1. Wicking Material: Absorbent rope, made from cotton, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity. Use only for weeps.
  - 2. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches (9 by 38 by 89 mm) long.
- E. Cavity Drainage Material: Semi-rigid polyethylene mesh panels, sized to the thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage. A mortar diverter out of 8" high panels designed for installation at flashing locations.
  - 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. Advanced Building Products, Inc: [www.advancedflashing.com](http://www.advancedflashing.com).
    - b. Mortar Net USA, Ltd: [www.mortarnet.com](http://www.mortarnet.com)
- F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
  - 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. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
    - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
    - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
    - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

## 2.11 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, closed-cell product extruded with an integral skin.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

## 2.12 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned. Cleaner to be for Red and Light-Colored Brick, Not Subject to Metallic Staining with Mortar Not Subject to Bleaching.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Diedrich Technologies, Inc.
- b. ProSoCo, Inc.

## 2.13 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.
  - 3. For exterior masonry, use portland cement-lime, masonry cement, or mortar cement mortar.
  - 4. For reinforced masonry, use portland cement-lime, masonry cement, or mortar cement mortar.
  - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
  - 1. For masonry below grade or in contact with earth, use Type S.
  - 2. For reinforced masonry, use Type S.
  - 3. For mortar parge coats, use Type N.
  - 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
  - 5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
  - 1. Pigments shall not exceed 10 percent of portland cement by weight.
  - 2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
  - 3. Mix to match Architect's sample.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
  - 1. Mix to match Architect's sample.
  - 2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
    - a. Face brick.
    - b. Cast stone trim units.
- F. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with 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, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi (20.6 MPa).
3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

## 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 cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match 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.
  1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

### 3.3 TOLERANCES

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

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) 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 (6 mm in 3 m), or 1/2 inch (12 mm) 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) 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 (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. 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.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. 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. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
  - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 " Joint Firestopping."

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow 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.
- B. 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.
- C. Set cast stone / calcium silicate trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
  - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  - 2. Allow cleaned surfaces to dry before setting.
  - 3. Wet joint surfaces thoroughly before applying mortar.

- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

### 3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
  - 1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
    - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement.
    - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.
  - 2. Header Bonding: Provide masonry unit headers extending not less than 3 inches (76 mm) into each wythe. Space headers not over 8 inches (203 mm) clear horizontally and 16 inches (406 mm) clear vertically.
  - 3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity.
- D. At masonry backup locations coat cavity face of backup wythe to comply with Section 071113 "Bituminous Dampproofing."
- E. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
  - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

### 3.7 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
  - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
  - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
  - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.8 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 (25 mm) 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 (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

### 3.9 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
  - 1. Fasten screw-attached anchors to concrete and masonry backup, with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  - 2. Embed tie sections in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of sheathing.
  - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  - 4. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. (0.33 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.

### 3.10 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 as follows:
  - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
  - 2. Install preformed control-joint gaskets designed to fit standard sash block.
  - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
  - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

- C. Form expansion joints in brick as follows:
1. Build flanges of factory-fabricated, expansion-joint units into masonry.
  2. Build in compressible joint fillers where indicated.
  3. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch (13 mm) for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."
- D. 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 Division 07 Section "Joint Sealants," but not less than 3/8 inch (10 mm).
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

### 3.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
1. Use specifically formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure pre-cast lintels before handling and installing. Temporarily support built-in place lintels until cured.
  2. If formed in-place lintels are used, contractor to comply with the requirements in Division 3- Concrete Work.
- C. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

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

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and through inner wythe to extend 1/2 inch (13 mm) beyond the face of wall in exposed masonry. Once Architect and Owner review installation, contractor to trim flashing back flush with face of masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (50 mm) on interior face.
  3. 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).
  4. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
  5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in 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. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
  - 4. Space weep holes formed from wicking material 16 inches (400 mm) o.c.
  - 5. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
  - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

### 3.13 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 (1520 mm).

### 3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 2 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.
- J. Where masonry units are exposed to view, provisions within ASTM C 216, ASTM C 129, ASTM C 90, and ASTM C 73 for finish and appearance are subject to architect and Owner's final review and acceptance. Sample masonry walls will be field selected and approved at various stages of construction and finishing, including interior CMU walls. The approved masonry walls will be subject to comparison to the approved sample masonry walls. Masonry walls not in compliance with the requirements herein are subject to removal, replacement, and/ or repair. Where masonry walls are rejected, the contractor will submit remedial options for review and acceptance to the Owner and Architect.

### 3.15 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean 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.
8. Clean stone trim to comply with stone supplier's written instructions.

### 3.16 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.

END OF SECTION 042000

## SECTION 047200 - CAST STONE MASONRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Cast stone / Calcium Silicate including the following:

- a. Miscellaneous trim units.
- b. Masonry Veneer

- B. Related Sections:

- 1. Section 042000 "Unit Masonry" for installing cast stone units in unit masonry.

#### 1.3 ACTION SUBMITTALS

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

- 1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

- 1. Include building elevations showing layout of units and locations of joints and anchors.

- C. Samples for Verification:

- 1. For each color and texture of cast stone / calcium silicate required, 10 inches (250 mm) square in size.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Architectural Precast Association or the Precast/Prestressed Concrete Institute for Group A, Category AT. Firm to assume responsibility for engineering architectural precast concrete units to comply with the performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

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

- C. Source Limitations for Cast Stone: Obtain cast stone units through single source from single manufacturer.
- D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- E. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockup of typical wall area as shown on Drawings.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast stone units in suitable packs or pallets.
  - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
  - 2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

#### 1.6 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 CAST STONE / CALCIUM SILICATE UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Basis of Design:
    - a. Arriscraft Architectural Building Stone – Renaissance Masonry Units.
  2. Indiana Limestone
  3. Missouri Limestone
- B. Color: to match existing elementary school addition:
1. Ironstone
- C. Texture: refer to drawings for locations:
1. Rockface:  
Size: Varies  
Pattern: Ashlar
  2. Window and door trim shapes as defined in the drawings.
- D. Provide cast stone units complying with ASTM C 1364 using either the vibrant dry tamp or wet-cast method.
1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- E. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
  2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
  3. Provide drips on projecting elements unless otherwise indicated.
- F. Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch (3 mm).
  2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater, but in no case by more than 1/4 inch (6 mm).
  3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater.
  4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch (3 mm) on formed surfaces of units and 3/8 inch (10 mm) on unformed surfaces.
- G. Cure units as follows:
1. Cure units in enclosed moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
- H. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

- I. Colors and Textures: As selected by Architect from manufacturer's full range to match appearance of cut Indiana limestone. If a mix of cast stone and calcium silicate units is provided, provide custom cast stone color to match selected calcium silicate.

## 2.2 MORTAR MATERIALS

- A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

## 2.3 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M.
- B. Dowels: 1/2-inch-(12-mm-) diameter, round bars, fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M.
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Diedrich Technologies, Inc.; a division of Sandell Construction Solutions.
    - b. PROSOCO, Inc.

## 2.4 MORTAR MIXES

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.

## 2.5 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test cast stone units according to ASTM C 1364.
  1. Include one test for resistance to freezing and thawing.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 SETTING CAST STONE / CALCIUM SILICATE IN MORTAR

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
  2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- B. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- C. Set units in full bed of mortar with full head joints unless otherwise indicated.
1. Set units with joints 1/4 to 3/8 inch (6 to 10 mm) wide unless otherwise indicated.
  2. Build anchors and ties into mortar joints as units are set.
  3. Fill dowel holes and anchor slots with mortar.
  4. Fill collar joints solid as units are set.
  5. Build concealed flashing into mortar joints as units are set.
  6. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.
  7. Keep joints at shelf angles open to receive sealant.
- D. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- E. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- G. Provide sealant joints at copings and other horizontal surfaces, at expansion, control, and pressure-relieving joints, and at locations indicated.
1. Keep joints free of mortar and other rigid materials.
  2. Build in compressible foam-plastic joint fillers where indicated.
  3. Form joint of width indicated, but not less than 3/8 inch (10 mm).
  4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
  5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

### 3.3 SETTING ANCHORED CAST STONE / CALCIUM SILICATE WITH SEALANT-FILLED JOINTS

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
  2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
- B. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.
- C. Fill anchor holes with sealant.

1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
- E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
  1. Form open joint of width indicated, but not less than 3/8 inch (10 mm).
- F. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

### 3.4 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch (1.5 mm), except where variation is due to warpage of units within tolerances specified.

### 3.5 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
  1. Remove mortar fins and smears before tooling joints.
  2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
  1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.

3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 047200

## SECTION 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. This Section includes the following:
  - 1. Structural steel.
  - 2. Architecturally exposed structural steel.
  - 3. Grout.
- B. Related Sections include the following:
  - 1. Division 01 Section "Quality Controls" for independent testing agency procedures and administrative requirements.
  - 2. Division 05 Section "Steel Decking" for field installation of shear connectors.
  - 3. Division 05 Section "Metal Fabrications" for steel lintels or shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.
  - 4. Division 9 painting section for surface preparation and priming requirements.

#### 1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.
- B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.
  - 1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design".
  - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.
- B. Construction: Type 2, simple framing.

## 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- 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.
  - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
  - 5. For structural-steel connections indicated to comply with design loads, include structural analysis data by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For installer, fabricator, detailer, and testing agency.
- E. Mill 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. Direct-tension indicators.
  - 4. Tension-control, high-strength bolt-nut-washer assemblies.
  - 5. Shear stud connectors.
  - 6. Shop primers.
  - 7. Non-shrink grout.
- F. Source quality-control test reports.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified steel erector specializing in performing work of this section with a minimum of five (5) years of documented experience.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program or a qualified fabricator who participates in the AWS Certified Welding Fabricator Program and is an AWS-Certified Plant or is designated an AISC-Certified Plant.
  - 1. EXCEPTION: The Owner will secure and pay for the services of the Special Inspector (as defined by the KBC) for this project. The Special Inspector shall verify that a fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards. The Special Inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work. The requirement for the fabrication shop to be AISC / AWS Certified will be waived when the Special Inspections outlined herein are completed to the satisfaction of the Special Inspector and the Architect. The fabricator shall reimburse the Owner for all costs and expenses associated with the performance of all Special Inspections carried out in the execution of this exception.

- C. Shop-Painting Applicators: Qualified according to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- E. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
  - 2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
  - 3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
  - 4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
  - 5. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
  - 6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- F. Detailer: Shop drawings shall be prepared by a qualified detailer who has a minimum of five (5) years of documented experience detailing structural steel and who is located within 200 miles of the project site.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

#### 1.7 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 erosion and deterioration.
  - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 2. 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.

#### 1.8 COORDINATION

- A. Furnish 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.

### PART 2 - PRODUCTS

#### 2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M, ASTM A 36/A 36M.
- B. Channels, Angles, **M**, **S**-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M, ASTM A 572/A 572M, Grade 50.

- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C or ASTM A1085.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
  - 1. Weight Class: As indicated on the plans.
  - 2. Finish: Black.
- F. Welding Electrodes: Comply with AWS requirements.

## 2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. 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.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), 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, plain.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
- D. Threaded Rods: A 572/A 572M, Grade 50 (345), ASTM A 36/A 36M.
  - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
  - 2. Washers: ASTM F 436 (ASTM F 436M) hardened.
  - 3. Finish: Plain.
- E. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
- F. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

## 2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

## 2.4 GROUT

- A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.
- C. 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.

## 2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
  - 1. Camber structural-steel members where indicated.
  - 2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
  - 3. Mark and match-mark materials for field assembly.
  - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Architecturally Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.
  - 1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale and roughness.
  - 2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
- C. 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.
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
  - 1. Bolt holes required in the field shall be drilled, not flame cut.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."
- G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- H. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.
- I. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches (250 mm) o.c., unless otherwise indicated.
- J. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces.
  - 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
  - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
    - a. Grind butt welds flush.
    - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

## 2.7 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 (50 mm).
  - 2. Surfaces to be field welded.
  - 3. Surfaces to be high-strength bolted with slip-critical connections.
  - 4. Surfaces to receive sprayed fire-resistive materials.
  - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 2, "Hand Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). 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 inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

## 2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.

1. Fill vent holes and grind smooth after galvanizing.
2. Galvanize lintels, shelf angles attached to structural-steel frame and located in exterior walls.

## 2.9 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
  1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
  1. Liquid Penetrant Inspection: ASTM E 165.
  2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
  3. Ultrasonic Inspection: ASTM E 164.
  4. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
  1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
  2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in

intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
  1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
  2. Weld plate washers to top of base plate.
  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 base or bearing plate before packing with grout.
  4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  1. Level and plumb individual members of structure.
  2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened unless noted otherwise on the drawings.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, 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 will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
  - 4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
    - a. Grind butt welds flush.
    - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
  - 1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
  - 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

### 3.6 REPAIRS 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 installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
  - 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 09 painting Sections.

END OF SECTION 051200

## SECTION 052100 - STEEL JOIST 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. This Section includes the following:

1. K-series steel joists
2. KCS-type K-series steel joists
3. K-series steel joist substitutes
4. Long-span steel joists
5. Joist girders
6. Joist accessories

- B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Division 04 Section "Unit Masonry" for installing bearing plates in unit masonry.
3. Division 05 Section "Structural Steel" for Supporting Steel Structure

#### 1.3 DEFINITIONS

- A. SJI "Specifications" : Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
- B. Design special joists to withstand design loads with live load deflections no greater than the following:
  1. Floor Joists: Vertical deflection of 1/360 of the span.
  2. Roof Joists: Vertical deflection of 1/360 of the span.

## 1.5 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product indicated.
- B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
  - 1. Indicate locations and details of bearing plates to be embedded in other construction.
  - 2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- C. Welding certificates.
- D. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.
- E. Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.
- F. Qualification Data: For manufacturer.
- G. Field quality-control test and inspection reports.
- H. Research/Evaluation Reports: For joists.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."
  - 1. Manufacturers' responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

## 1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.
- B. Steel Bearing Plates: ASTM A 36/A 36M.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
  - 1. Finish: Plain, uncoated.
- D. 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.
- E. Welding Electrodes: Comply with AWS standards.

### 2.2 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
- B. Primer: Provide shop primer that complies with Division 09 painting Sections.

### 2.3 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
  - 1. Joist Type: K-series steel joists and KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- D. Provide holes in chord members for connecting and securing other construction to joists.
- E. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- F. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- G. Camber joists according to SJI's "Specifications."

- H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

## 2.4 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Camber long-span steel joists according to SJI's "Specifications."
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

## 2.5 JOIST GIRDERS

- A. Manufacture joist girders according to "Standard Specifications for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joist girders.
- D. Camber joist girders according to SJI's "Specifications."
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

## 2.6 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- C. Bridging: Fabricate as indicated and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
- D. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- E. Steel bearing plates with integral anchorages are specified in Division 05 Section "Metal Fabrications."

- F. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface, unless otherwise indicated.
- G. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

## 2.7 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.
- D. Shop priming of joists and joist accessories is specified in Division 09 painting sections.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
  - 1. Before installation, splice joists delivered to Project site in more than one piece.
  - 2. Space, adjust, and align joists accurately in location before permanently fastening.
  - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
  - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.

- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Field welds will be visually inspected according to AWS D1.1/D1.1M.
- C. In addition to visual inspection, field welds will be tested according to AWS D1.1/D1.1M and the following procedures, as applicable:
  - 1. Radiographic Testing: ASTM E 94.
  - 2. Magnetic Particle Inspection: ASTM E 709.
  - 3. Ultrasonic Testing: ASTM E 164.
  - 4. Liquid Penetrant Inspection: ASTM E 165.
- D. Bolted connections will be visually inspected.
- E. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- F. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- G. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

### 3.4 REPAIRS 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 installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
  - 1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
  - 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 09 painting sections.
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05210

## SECTION 053100 - STEEL DECKING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:

1. Steel roof deck.
2. Acoustical steel roof deck.

- B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill.
2. Division 5 Section "Structural Steel" for supporting steel structure.
3. Division 5 Section "Structural Steel" for shop- and field-welded shear connectors.
4. Division 5 Section "Structural Steel" for framing deck openings with miscellaneous steel shapes.
5. Division 5 Section "Steel Bar Joists" for supporting structure.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. Installation instructions: Submit deck manufacturer's installation instructions to the Architect/Engineer for review.
- D. Product Certificates: For each type of steel deck, signed by product manufacturer, certifying that their products comply with specified requirements.
- E. Field quality-control test and inspection reports.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
  1. Mechanical fasteners.
- G. Research/Evaluation Reports: For steel deck.

## 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An installer with a minimum of five (5) years of documented experience completing steel deck erection Work similar in materials, 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. Testing Agency Qualifications: An independent agency qualified according to ASTM E329 for testing indicated
- C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members".
- D. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approved Guide, Building Materials" for Class 1 fire rating and Class I-90 windstorm ratings.
- E. Steel Deck Institute (SDI) Publications: Comply with the requirements set forth in the following unless more stringent provisions are indicated in the Contract Documents.
  - 1. DDMD2, "SDI Diaphragm Design Manual"
  - 2. MOC1, "SDI Manual of Steel Construction"
  - 3. SDI "Standard Practice Details"
  - 4. SDI "Deck Damage and Penetrations"

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Steel Deck:
    - a. Epic Metals Corporation
    - b. Nucor Corp., Vulcraft Division
    - c. New Millennium Building Systems
    - d. CSM Metal Deck
    - e. Metal Dek Group, a division of Consolidated Systems, Inc.

## 2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230) G90 (Z275) zinc coating.
  2. Deck Profile: Type B, wide rib
  3. Profile Depth: 1-1/2 inches (38 mm)
  4. Design Uncoated-Steel Thickness: As indicated
  5. Span Condition: Triple span or more
  6. Side Laps: Overlapped

## 2.3 ACOUSTICAL ROOF DECK

- A. Acoustical Steel Roof Deck: Fabricate panels, without top flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck" in SDI Publication No. 30 and with the following:
1. Galvanized Steel Sheet: As Specified above in Section 2.2.
  2. Acoustical Deck Profile: As Specified above in Section 2.2.
  3. Profile Depth: As Specified above in Section 2.2.
  4. Design Uncoated-Steel Thickness: As indicated
  5. Span Condition: Triple span or more where possible.
  6. Side Laps: Overlapped
  7. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs
  8. Sound-Absorbing Insulation: Manufacturer's standard pre-molded roll or strip of glass or mineral fiber.
  9. Acoustical Performance: NRC 0.75, tested according to ASTM C 423.

## 2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and sloped recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.
- J. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.
- K. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

### 3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent over-loading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Welding of metal deck is prohibited on this project.
- I. Install 6-inch (minimum) wide steel cover plates, with same thickness and finish of deck, where deck changes span direction.
- J. Mechanical fasteners shall be used to fasten deck. Locate mechanical fasteners as indicated on the drawings, and install according to deck manufacturer's written instructions. Welding steel deck to supporting steel structure is prohibited on this project.

### 3.3 ROOF DECK INSTALLATION

- A. Mechanically fasten roof-deck panels to supporting steel structure.
  - 1. Fastener Size: No. 12 self-drilling, self-tapping screws. The Contractor shall select screws of sufficient length to completely engage the thickness of the supporting steel structure. The thread pitch shall be appropriate for the thickness of the supporting steel member.
  - 2. Fastener Spacing: As indicated on the drawings.
  - 3. Alternate Fastener Systems: The Contractor may propose alternate fastening system such as Powder Actuated Fasteners or Pneumatically Driven Fasteners. The Alternate System must develop diaphragm shear capacity equal to or greater than that achieved by the specified system.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as follows.
  - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws. Side lap fastener spacing shall be as indicated on the drawings.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
  - 1. End Joints: Lapped 2 inches (51 mm) minimum
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches (305 mm) apart with at least one fastener at each corner.
  - 1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.
  - 1. Mechanically fasten cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

### 3.4 FIELD QUALITY CONTROL

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

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

## SECTION 054000 - COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Exterior miscellaneous metal framing
  - 2. Interior miscellaneous metal framing
  - 3. Seismic bracing
- B. Related Sections include the following:
  - 1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
  - 2. Division 05 Section "Engineered Light Gauge Metal Trusses" for metal truss fabrications.
  - 3. Division 09 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads:
    - a. Dead Loads: Weights of materials and construction
    - b. Snow Loads: Per ASCE 7-10, "Minimum Design Loads for Buildings"
    - c. Wind Loads: Per ASCE 7-10, "Minimum Design Loads for Buildings"
    - d. Seismic Loads: Per ASCE 7-10, "Minimum Design Loads for Buildings"
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height.
    - b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft. (239 Pa).
    - c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
    - d. Roof Rafter Framing: Horizontal deflection of 1/360 of the horizontally projected span.
    - e. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.
  - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
  - a. Upward and downward movement of 1/2 inch (13 mm).
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
  1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
  2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
  1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For both professional engineer and testing agency.
- E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
  1. Steel sheet.
  2. Expansion anchors.
  3. Power-actuated anchors.
  4. Mechanical fasteners.
  5. Vertical deflection clips.
  6. Horizontal drift deflection clips
  7. Miscellaneous structural clips and accessories.
- F. Research/Evaluation Reports: For cold-formed metal framing.

#### 1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of

cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel." Welders performing work on Cold Formed Metal shall hold AWS certification for the types of weld being executed.
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
  - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
  - 1. Clark Steel Framing.
  - 2. Consolidated Fabricators Corp.; Building Products Division.
  - 3. Dale/Incor.
  - 4. Dietrich Metal Framing; a Worthington Industries Company.
  - 5. MarinoWare; a division of Ware Industries.

6. Gold Bond Building Products; a division of National Gypsum Co.
7. Structural Steel Systems (Tri-S)

## 2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
  1. Grade: ST33H (ST230H).
  2. Coating: G60 (Z180).
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
  1. Grade: 50 (340), Class 1 or 2.
  2. Coating: G90 (Z275).

## 2.3 MISCELLANEOUS FRAMING

- A. Refer to Specification Section 09255 – Gypsum Board Assemblies for interior walls and partitions.
- B. Steel Framing: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
  1. Minimum Base-Metal Thickness:
    - a. Exterior framing – 0.0396 inch (1.00 mm)
    - b. Interior framing – 0.0217 inch (0.55 mm)
  2. Flange Width: 1-5/8 inches (41 mm)
  3. Web: Punched
- C. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
  1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
  2. Flange Width: Manufacturer's standard deep flange where indicated; standard flange elsewhere.
- D. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
  1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dietrich Metal Framing; a Worthington Industries Company.
    - b. MarinoWare, a division of Ware Industries.
    - c. The Steel Network, Inc.
    - d. Structural Steel Systems (Tri-S)

- E. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dietrich Metal Framing; a Worthington Industries Company.
    - b. MarinoWare, a division of Ware Industries.
    - c. The Steel Network, Inc.
    - d. Structural Steel Systems (Tri-S0

## 2.4 SEISMIC BRACING

- A. Steel Braces: Manufacturer's standard C-shaped steel joists, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0635 inch (1.61 mm).
  2. Flange Width: 1-5/8 inches (41 mm), minimum.
- B. Steel Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel braces.
  2. Flange Width: 1-5/8 inches (41 mm), minimum.

## 2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
  2. Bracing, bridging, and solid blocking.
  3. Web stiffeners.
  4. Anchor clips.
  5. End clips.
  6. Foundation clips.
  7. Gusset plates.
  8. Stud kickers, knee braces, and girts.
  9. Joist hangers and end closures.
  10. Hole reinforcing plates.
  11. Backer plates.

## 2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035 with dry film containing a minimum of 94 percent zinc dust by weight.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## 2.8 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
  4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

### 3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable framing system.

### 3.4 FIELD QUALITY CONTROL

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

### 3.5 REPAIRS AND PROTECTION

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

END OF SECTION 054000

## SECTION 055000 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Miscellaneous steel trim including steel edgings.
  - 2. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
  - 1. Section 033000 "Concrete Work" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
  - 2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
  - 3. Section 051200 "Structural Steel Framing."

#### 1.3 COORDINATION

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

#### 1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  - 1. Steel framing and supports for countertops.

2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Miscellaneous steel trim including steel edgings.
4. Metal downspout boots.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

#### 1.6 QUALITY ASSURANCE

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

#### 1.7 FIELD CONDITIONS

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

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders. Shopdrawing Submittal to include the Professional Engineer Stamp, licensed in the State of Kentucky.
- B. 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

#### 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

- D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- E. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
- H. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- I. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- J. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- K. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

### 2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting."
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

### 2.4 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 (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

## 2.5 MISCELLANEOUS FRAMING AND SUPPORTS

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

## 2.6 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.

## 2.7 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.

## 2.8 STEEL WELD PLATES AND ANGLES

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

## 2.9 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.10 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## 2.11 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Extruded Aluminum: Two coats of clear lacquer.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

### 3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 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 (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting."

END OF SECTION 055000

## SECTION 055190 – POST INSTALLED CONCRETE ANCHORS

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Section Includes: Cast-in and drilled in anchors for concrete.
- B. Related Sections:
  - 1. Division 3 Concrete Sections.
  - 2. Division 4 Masonry Sections.
  - 3. Division 5 Metals Sections.

#### 1.2 SUBMITTALS

- C. General: Submit in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
  - 1. Product specifications with recommended design values and physical characteristics for epoxy dowels, expansion and undercut anchors.
  - 2. Samples: Representative length and diameters of each type anchor shown on the Drawings.
  - 3. Quality Assurance Submittals:
    - a. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
    - b. Certificates:
      - 1) ICC ES Evaluation Reports.
  - 4. Manufacturer's installation instructions.
  - 5. Installer Qualifications & Procedures: Submit installer qualifications as stated in Section 1.03.B. Submit a letter of procedure stating method of drilling, the product proposed for use, the complete installation procedure, manufacturer training date, and a list of the personnel to be trained on anchor installation.
- D. Closeout Submittals: Submit the following:
  - 1. Record Documents: Project record documents for installed materials in accordance with Division 1 Closeout Submittals Section.

#### 1.4 QUALITY ASSURANCE

- E. Installer Qualifications:
  - 1. Drilled-in anchors shall be installed by an installer with at least three years of experience performing similar installations.
- F. Installer Training: Conduct a thorough training with the manufacturer or the manufacturer's representative for each installer on the project. Training to consist of a review of the complete installation process for drilled-in anchors, to include but not limited to:
  - 1. hole drilling procedure
  - 2. hole preparation & cleaning technique

3. adhesive injection technique & dispenser training / maintenance
  4. rebar dowel preparation and installation
  5. proof loading/torquing
- G. Certifications: Unless otherwise authorized by the Engineer, anchors shall have the following certifications:
1. ICC ES Evaluation Report indicating conformance with current applicable ICC ES Acceptance Criteria.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with Division 1 Section–Product Storage and Handling Requirements.
1. Store anchors in accordance with manufacturer’s recommendations.

### **PART 2 – PRODUCTS**

#### 2.1 MATERIALS

- A. Fasteners and Anchors:
1. Bolts and Studs: ASTM A307; ASTM A449 where “high strength” is indicated on the Drawings.
  2. Carbon and Alloy Steel Nuts: ASTM A563.
  3. Carbon Steel Washers: ASTM F436.
  4. Carbon Steel Threaded Rod: ASTM A36; or ASTM A193 Grade B7; or ISO 898 Class 5.8.
  5. Wedge Anchors: ASTM A510; or ASTM A108.
  6. Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.
  7. Stainless Steel Nuts: ASTM F594.
  8. Zinc Plating: ASTM B633.
  9. Hot-Dip Galvanizing: ASTM A153.
  10. Reinforcing Dowels: ASTM A615

#### 2.2 CAST-IN-PLACE BOLTS

- A. Anchors, Bolts, Nuts, and Washers: Cast-In-Place Anchor Bolts shall conform to ASTM F1554, Grade as Specified. Nuts shall be A563, Grade DH or A194, Grade 2H. Hardened Flat Washers shall be F436.

#### 2.3 DRILLED-IN ANCHORS

- A. Wedge Anchors: Wedge type, torque-controlled, with impact section to prevent thread damage complete with required nuts and washers. Provide anchors with length identification markings conforming to ICC ES AC01 or ICC ES AC193. Type and size as indicated on Drawings.

1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1).
  2. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 and Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Stainless steel nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
  3. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
    - a. Hilti Kwik Bolt 3, ICC ESR-1385 and ESR-2302.
    - b. Hilti Kwik Bolt TZ, ICC ESR-1917 (carbon steel and AISI Type 304 Stainless Steel).
- B. Screw Anchors: screw type. Pre-drilling of the hole requires a standard ANSI drill bit with the same diameter as the anchor and installing the anchor will be done with an impact wrench. Provide anchors with a diameter and anchor length marking on the head. Type and size as indicated on Drawings.
1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel anchors with zinc plating equivalent to DIN EN ISO 4042 (8 $\mu$ m min.).
  2. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
    - a. Hilti Kwik-HUS-EZ, ICC-ESR 3027.
    - b. Hilti Kwik-HUS EZ-I, ICC-ESR 3027.
    - c. Hilti Kwik-HUS.
- C. Cartridge Injection Adhesive Anchors: Threaded steel rod, inserts or reinforcing dowels, complete with nuts, washers, polymer or hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on Drawings.
1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel threaded rods conforming to ASTM A36, ASTM A 193 Type B7 or ISO 898 Class 5.8 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) [or carbon steel HIT TZ rods conforming to ASTM A510 with chemical composition of AISI 1038].
  2. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 and Type 316 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
  3. Reinforcing dowels shall be A615 Grade 60.
  4. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
    - a. Hilti HAS threaded rods with HIT-HY 200 Safe Set System using Hilti Hollow Drill Bit System for anchorage to concrete, ICC ESR-3187.

- b. Hilti HIT-Z anchor rods with HIT-HY 200 Safe Set System for anchorage to concrete, ICC ESR-3187.
- c. Hilti HAS threaded rods with RE 500 SD Injection Adhesive Anchoring System for anchorage to concrete, ICC ESR-2322.
- d. Hilti HAS threaded rods with RE 500 Injection Adhesive Anchoring System for anchorage to concrete.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

- A. Cast-In-Place Bolts: Use templates to locate bolts accurately and securely in formwork.
- B. Drilled-In Anchors:
  - 1. Drill holes with rotary impact hammer drills using carbide-tipped bits, hollow drill bit system, or core drills using diamond core bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
    - a. Cored Holes: Where anchors are permitted to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer. Properly clean cored hole per manufacturer's instructions.
    - b. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.
    - c. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  - 2. Perform anchor installation in accordance with manufacturer instructions.
  - 3. Wedge Anchors, Heavy-Duty Sleeve Anchors, and Undercut Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Engineer.
  - 4. Cartridge Injection Adhesive Anchors: Clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

5. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors.

### 3.2 REPAIR OF DEFECTIVE WORK

- A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

### 3.3 FIELD QUALITY CONTROL

- A. Anchor installation for each type of Post-Installed anchor shall be inspected in accordance with the requirements of the applicable ICC Evaluation Report.
- B. Testing: 10% of each type and size of drilled-in anchor shall be proof loaded by the independent testing laboratory. Adhesive anchors and capsule anchors shall not be torque tested unless otherwise directed by the Engineer. If any of the tested anchors fail to achieve the specified torque or proof load within the limits as defined on the Drawings, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Engineer.
  1. Tension testing should be performed in accordance with ASTM E488.
  2. Torque shall be applied with a calibrated torque wrench.
  3. Proof loads shall be applied with a calibrated hydraulic ram. Displacement of adhesive and capsule anchors at proof load shall not exceed  $D/10$ , where D is the nominal anchor diameter.
- C. Minimum anchor embedments, proof loads and torques shall be as shown on the Drawings.

END OF SECTION

## SECTION 064100 - ARCHITECTURAL WOOD CASEWORK

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

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

#### 1.02 SECTION INCLUDES

- A. Glass shelving at displays.
- B. Countertops not associated with modular casework or science casework.
- C. Preparation for installing utilities.
- D. Sliding Glass Door Display Case, glass shelving and back tackboard.

#### 1.03 RELATED REQUIREMENTS

- A. Section 061053 – Miscellaneous Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 123216 – Manufactured Plastic-Laminate-Faced Casework
- C. Section 123661 – Simulated Stone Countertops and Sills

#### 1.04 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.
- B. ANSI A208.1 - American National Standard for Particleboard; 1999.
- C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2002.
- D. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- E. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.9).
- F. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

#### 1.05 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Convene a pre-installation meeting not less than one week before starting work of this section; require attendance by all affected installers.

#### 1.06 SUBMITTALS

- A. See Division 01, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories.

#### 1.07 QUALITY ASSURANCE

- A. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.

- B. Perform cabinet construction in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum **five** years of documented experience.

1.08 SUPPLIER QUALIFICATIONS:

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of experience.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Protect units during transit, delivery, storage, and handling to prevent damage.
- B. Do not deliver units until painting and similar operations that could damage, soil or deteriorate units have been completed in installation areas.
- C. If units will be stored at Project Site, store units only in areas whose environmental conditions meet requirements specified.

1.10 FIELD CONDITIONS

- A. Coordinate sizes and locations of blocking, furring, reinforcements and other related units of Work specified in other Sections to ensure that casework units can be supported and installed as indicated.
- B. Field Measurements: Where casework units will be fitted to other construction, verify dimensions with actual field measurements before fabrication, and indicate recorded dimensions on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Verify locations of concealed blocking, furring, reinforcements that support casework units by accurate field measurements before being enclosed. Record field measurements on final shop drawings.
- C. During and after installation of casework units, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 - PRODUCTS

2.01 PANEL MATERIALS

- A. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.
  - 1. Use as backing for plastic laminate unless otherwise indicated.

2.02 LAMINATE MATERIALS

- A. Manufacturers:
  - 1. Formica Corporation: [www.formica.com](http://www.formica.com).
  - 2. Panolam Industries International, Inc\Nevamar: [www.nevamar.com](http://www.nevamar.com).
  - 3. Wilsonart International, Inc: [www.wilsonart.com](http://www.wilsonart.com).
  - 4. Substitutions: See Division 01
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- C. Provide specific types as follows:

1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness, through color, color as selected from full range of standard and Premium Laminates.
2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, through color, color as selected from full range of WilsonArt Standard Laminates.
3. Post-Formed Horizontal Surfaces: HGP, 0.039 inch (1.0 mm) nominal thickness, color as selected from full range of WilsonArt Standard Laminates.
4. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness, through color, color as selected, from standard laminate colors.
5. Laminate Backer: BKH, (.048), (0.39), and (0.28) nominal thicknesses, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
6. Thermally-fused melamine laminate, NEMA LD 3-2005, color matched with white.

## 2.03 SLIDING GLASS DOOR DISPLAY CASE AND SHELVING

- A. Sliding glass door assembly: refer to floor plan for quantity and extent.
- B. Aluminum: 6063-T5 aluminum alloy, Clear Anodized Finish. Fasteners to be concealed when doors/windows are closed.
- C. Glass Shelves: Glass shall be 16" deep (coordinate with bracket length listed below), 3/8" thick uncoated clear heat-treated float, kind FT (fully tempered), with eased edges. Field verify finished width of display case. Glass shelf length to be wall to wall with 1/2" clearance each end of shelf.
- D. Brackets: Basis of Design: Knape & Vogt: 185 Series Brackets: Color: Anochrome, 16" deep.
- E. Glass Doors: Shall be glass sliding with 1/4" float, fully tempered, glass with polished edges supported from bottom by an aluminum show with nylon rollers, operating on an aluminum bottom track. An aluminum plastic guide track shall be provided at the top. Doors shall be provided with round, recessed, nickel plated finger pulls.
- F. Trim: Shall be 1 1/2" aluminum angle, clear Anodized Finish.
- G. Lock: Basis of Design: Knape & Vogt; Adjustable lock, # 965NP, Polished nickel.
- H. Fabrication: All work shall be done to reflect the highest standards.
- I. Tackboard and fabric: Vinyl fabric-faced tackboard panel on core of 3/8" fiber board over rigid framing. Acceptable manufacturers listed in "Visual Display Units -101100."

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

### 3.02 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (1 mm). Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages.

### 3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 064100

## SECTION 071900 - WATER REPELLENTS

### 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 penetrating water-repellent treatments for the following vertical and horizontal surfaces:
  - 1. Split-face concrete unit masonry.

#### 1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.
- B. Mockups: Apply water repellent to each type of substrate required.
  - 1. Locate each test application as directed by Architect.
  - 2. Size: 10 sq. ft. (9.3 sq. m).
  - 3. Final approval by Architect of water-repellent application will be from test applications.
- C. Pre-installation Conference: Conduct conference at Project site.

### PART 2 - PRODUCTS

#### 2.1 PENETRATING WATER REPELLENTS

- A. Silane, Penetrating Water Repellent: Clear, containing 20 percent or more solids of alkyltrialkoxysilanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Advanced Chemical Technologies, Inc; Sil-Act ATS-100.

- b. BASF Corporation; Construction Systems; MasterProtect H 400 (Pre-2014: Enviroseal 40).
  - c. Nox-Crete Products Group; Stifel GC.
  - d. Pecora Corporation; KlereSeal 9100-S.
  - e. Tamms; a brand of Euclid Chemical Company; an RPM Company; Barcade Silane 100.
- B. Siloxane, Penetrating Water Repellent: Clear, containing 10 percent or more solids of oligomeric alkylalkoxysiloxanes; with alcohol, ethanol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Chemical Products Industries, Inc; CP-500W.
    - b. ChemMasters, Inc; Aquanil Plus WB.
    - c. Diedrich Technologies, Inc.; a division of Sandell Construction Solutions; 303-C.
    - d. Euclid Chemical Company (The); an RPM company; Euco-Guard VOX.
    - e. SaverSystems; DEFY Water Repellent for Brick.
    - f. Specco Industries, Inc; Waterstopper S-10 WB Siloxane.
    - g. Tamms; a brand of Euclid Chemical Company; an RPM Company; Barcade M.E..
- C. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 400 g/L or less of VOCs.
- 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. BASF Corporation; Construction Systems.
    - b. L&M Construction Chemicals, Inc; Aquapel.
    - c. Pecora Corporation; KlereSeal 910-W.
    - d. PROSOCO, Inc; Saltguard WB.
    - e. Tamms; a brand of Euclid Chemical Company; an RPM Company; Barcade WB 244.
    - f. Tnemec Inc; Dur A Pell 10.
    - g. Wacker Chemical Corporation; Silres BS 1001A.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
  - 1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
  - 2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.

3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
  4. Verify that required repairs are complete, cured, and dry before applying water repellent.
- B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:
1. Cast Stone: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E 1857.
  2. Clay Brick Masonry: ASTM D 5703.
  3. Calcium Silicate Masonry: As recommended by manufacturer.
- B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

### 3.3 FIELD QUALITY CONTROL

- A. Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:
1. Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  2. Testing agency will perform tests for compliance of water-repellent material with product requirements.
  3. Owner may direct Contractor to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove noncomplying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect...
- B. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product application. A change in surface color will indicate incomplete application.
1. Reapply water repellent until coverage test indicates complete coverage.

### 3.4 CLEANING

- A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.
- B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 071900

## 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. Glass-fiber blanket insulation.
3. Mineral-wool blanket insulation.
4. Loose-fill insulation.

- B. Related Sections:

1. Section 042000 "Unit Masonry" for insulation installed in cavity walls and masonry cells.

#### 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.

#### 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 due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
  1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation 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 Dow: The Dow Chemical Company
    - b. Kingspan Insulation.
    - c. Owens Corning.
  2. Type VI, 40 psi (276 kPa).
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

### 2.2 GLASS-FIBER BLANKET INSULATION

- 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. CertainTeed Corporation.
  2. Johns Manville; a Berkshire Hathaway company.
  3. Owens Corning.
  4. Knauf Insulation
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- C. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
- D. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

### 2.3 MINERAL-WOOL BLANKET INSULATION

- A. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

## 2.4 LOOSE-FILL INSULATION

- A. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I for pneumatic application; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

## 2.5 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

- 1. Products: Subject to compliance with requirements, provide one of the following:
  - a. AGM Industries, Inc; Series T TACTOO Insul-Hangers.
  - b. Gemco; Spindle Type.
- 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
- 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

- B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

- 1. Products: Subject to compliance with requirements, provide one of the following:
  - a. AGM Industries, Inc; TACTOO Adhesive.
  - b. Gemco; Tuff Bond Hanger Adhesive.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or that interfere 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 footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces under slabs, 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 (610 mm) in from exterior walls.

### 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. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch (76-mm) 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 (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- D. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
- E. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

### 3.5 INSTALLATION OF STOREFRONT INSULATION

- A. Install board insulation in storefront construction where indicated on Drawings according to storefront manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

### 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 072119 - FOAMED-IN-PLACE INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

1. Closed-cell spray polyurethane foam.
2. Open-cell spray polyurethane foam.

- B. Related Requirements:

1. Section 042000 "Unit Masonry" for preparation of cavity walls and masonry accessories for installation of spray-applied insulation.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Quality Assurance Program: Submit evidence of current accreditation of the subcontractor and certification of the installers under the Air Barrier Association of America's (ABAA) Quality Assurance Program. Submit accreditation number of subcontractor and certification number of installers.

- B. Product Data: Submit manufacturer's product data, manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.

1. Submit letter from primary materials manufacturer indicating approval of products not manufactured by primary manufacturer.
2. Include statement that materials are compatible with adjacent materials proposed for use.
3. Submit reports indicating that field peel-adhesion test on all materials to which sealants are adhered have been performed and the changes made, if required, to other approved materials, in order to achieve successful adhesion.

- C. Samples: Submit labeled samples, 3 by 4 inch (75 mm by 100 mm) minimum size of each material specified.

- D. Shop Drawings: Submit shop drawings showing locations and extent of air barrier assemblies and details of typical conditions. Drawings shall indicate manufacturer's

recommended closures of gaps in wall construction, counter-flashings, integrity of insulation thickness at corners, and sealing of miscellaneous conduit, piping, electrical rough-in boxes and similar items are sealed.

- E. Compatibility: Submit letter from manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use. Submit letter from manufacturer stating that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.
- F. Provide a list of recommended sealants at location in contact with membrane flashings.

#### 1.4 QUALITY ASSURANCE

- A. Air Barrier Subcontractor Qualifications: Installer shall be accredited by the Air Barrier Association of America (ABAA).
  - 1. Installer shall be certified by BPQI (Building Performance Quality Institute) in accordance with the training requirements outlined in the ULC S705.2-05 Installation Standard.
  - 2. Installer shall have at least 3-years of successful experience in application of spray polyurethane foam. Installer must be a NCIF Gola Star certified insulation contractor or have SPF manufacturer's certification for the application.
- B. Equipment: Installer shall have equipment to spray-apply polyurethane foam including, but not limited to, high pressure plural component proportioning pump, heated hoses of suitable length, spray gun, drum pumps or other ancillary equipment necessary for the Project.
- C. Manufacturer: Obtain primary materials from a single manufacturer regularly engaged in manufacturing air barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.
- D. Accredited Laboratory Testing for Materials: Laboratory accredited by International Accreditation Service Inc. (IAS), American Association for Laboratory Accreditation (A2LA), or the Standards Council of Canada (SCC).
- E. Field Quality Assurance: Implement the ABAA Quality Assurance Program requirements. Cooperate with ABAA inspectors and independent testing and inspection agencies engaged by the Owner. Do not cover air barrier until it has been inspected, tested and accepted.
- F. Preconstruction Meeting: Agenda shall include, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages or containers with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages or containers in a clean, dry, protected location and within temperature range required by air barrier membrane manufacturer. Protect stored materials from direct sunlight.
- C. Handle materials in accordance with manufacturer's recommendations.

## 1.6 PROJECT CONDITIONS

- A. Temperature: Install air barrier within range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply air barrier to a damp or wet substrate.
- B. Field Conditions: Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

## 1.7 WARRANTY

- A. Material Warranty: Provide manufacturer's standard product warranty, for a minimum 3 years from date of Substantial Completion.
- B. Installation Warranty: Provide air barrier subcontractor's **2 year** warranty from date of Substantial Completion, including all components of the air barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

## PART 2 - PRODUCTS

### 2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft. (24 kg/cu. m) and minimum aged R-value at 1-inch (25.4-mm) thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (43 K x sq. m/W at 24 deg C).
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation.
    - b. Dow Chemical Company (The).
    - c. Henry Company.
    - d. Icynene Inc.
  - 2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- a. Flame-Spread Index: 25 or less.
  - b. Smoke-Developed Index: 450 or less.
3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

## 2.2 OPEN-CELL SPRAY FOAM INSULATION

- A. Manufacturer's
  - 1. Same as listed for closed-cell foam.
- B. R-Value = 3.7 per 1" thickness.
- C. Installation to occur where indicated in drawing.

## 2.3 MISCELLANEOUS MATERIALS

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

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for spray polyurethane foam.
  - 1. Ensure that penetrating work by other trades is in place and complete.
  - 2. Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants, which may affect adhesion of the spray polyurethane foam.
  - 3. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the spray polyurethane foam.
  - 4. Ensure masonry veneer anchors are in place.
  - 5. Test substrate with Moisture Detection Paper (MDP) strips to affirm that the substrate is dry.
- C. Prime substrate for application of sheet membrane transition strips as recommended by manufacturer and as follows:
  - 1. Prime masonry, concrete substrates with conditioning primers.

2. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
3. Prime wood, metal, and painted substrates with primer.
4. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions.

D. Protection from Spray Applied Materials:

1. Mask and cover adjacent areas to protect from over spray.
2. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
3. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

### 3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.
- E. Cavity Walls: Install into cavities to thickness indicated on Drawings.
- F. Miscellaneous Voids: Apply according to manufacturer's written instructions.
- G. Transition Strip Installation: Install transition strip materials to provide continuity throughout the building envelope. Install materials in accordance with manufacturer's recommendations and the following:
  1. Apply primer for transition strips at rate recommended by manufacturer. Allow primer to dry completely before transition strip application. Apply as many coats as necessary for proper adhesion.
  2. Position subsequent sheets of transition strips applied above so that membrane overlaps the membrane sheet below by a minimum of 2 inches (50 mm), unless greater overlap is recommended by manufacturer. Roll into place with roller.
  3. Overlap horizontally adjacent pieces of transition strips a minimum of 2 inches (50 mm), unless greater overlap is recommended by manufacturer. Roll seams with roller.
  4. Seal around all penetrations with a transition strip or other procedure in accordance with manufacturer's recommendations.
  5. Connect air barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior doors, penetrations, and other intersection conditions using

transition membranes and in accordance with the manufacturer's recommendations.

6. At changes in substrate plane, provide transition material recommended by manufacturer to make a smooth transition from one plane to another.
  7. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Membrane shall be continuously supported by substrate.
  8. At through-wall flashings, provide an additional 6-inch wide strip of manufacturer's recommended membrane counter-flashing to seal top of through-wall flashing to membrane. Seal exposed top edge of strip with bead of mastic as recommended by manufacturer.
  9. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.
  10. At expansion joints provide transition to the joint assemblies.
  11. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer when membrane will be exposed to the elements.
  12. At end of each working day, seal top edge of self-adhered membrane to substrate with termination mastic if exposed.
  13. Do not allow materials to come in contact with chemically incompatible materials.
  14. Do not expose transition membrane to sunlight longer than as recommended by the manufacturer.
  15. Inspect installation prior to enclosing assembly and repair damaged areas with spray polyurethane foam as recommended by manufacturer.
  16. At flashing installation for aluminum frame jamb and sills, refer to architectural details for recessing flashing.
- H. Spray Application of Polyurethane: Install materials in accordance with manufacturer's recommendations, ULC S705.2 and the following:
1. Equipment used to spray polyurethane foam shall comply with ULC S705.2 and the manufacturer's recommendations for the specific type of application. Record equipment settings on the Daily Work Record as required by the ULC S705.2 installation standard. Each proportioner unit shall supply only one spray gun.
  2. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer and the ULC S705.2 Installation standard.
  3. Apply in consecutive passes as recommended by manufacturer to thickness as indicated on drawings. Passes shall be not less than 1/2 inch and not greater than 2 inches. An additional pass of 2 inches shall only be done after the first pass has had time to cool down. At no time shall more than 4 inches be installed in a single day.
  4. Install within manufacturer's tolerances, but not more than minus 1/4 inch or plus 1/2 inch.
  5. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.
  6. Finished surface of foam insulation to be free of voids and embedded foreign objects.
  7. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.

8. Trim any excess thickness, provide the 3/4" minimum clearance to back of face brick or ground face concrete masonry units.
9. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.
10. Complete connections to other components and repair any gaps, holes or other damage using material, which conforms to ULC S710.1 or ULC S711.1 and installed in accordance with ULC S710.2 or ULC S711.2 as applicable.

### 3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
  1. Coordinate with installation of materials which cover spray polyurethane foam air barrier, to ensure exposure period does not exceed that recommended by the manufacturer.
- B. Clean all spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION 072119

## SECTION 072500 - WEATHER 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. Building wrap.
- B. Related Requirements:
  - 1. Section 061600 "Sheathing" for sheathing joint and penetration treatment.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

### PART 2 - PRODUCTS

#### 2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
  - 1. Water-Vapor Permeance: Not less than 75 perms (4300 ng/Pa x s x sq. m) per ASTM E 96/E 96M, Desiccant Method (Procedure A).
  - 2. Allowable UV Exposure Time: Not less than three months.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

#### 2.2 MISCELLANEOUS MATERIALS

- A. Nails and Staples: ASTM F 1667.

## PART 3 - EXECUTION

### 3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
  - 1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
  - 2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.
- C. Building Wrap: Comply with manufacturer's written instructions.
  - 1. Seal seams, edges, fasteners, and penetrations with tape.
  - 2. Extend into jambs of openings and seal corners with tape.

END OF SECTION 072500

SECTION 074113.16 – STANDING SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Prefabricated prefabricated and field-assembled, machined seamed standing seam metal roof, batten caps, bearing plates, clips, fasteners, perimeter and penetration flashings, closures, sealants, trim, vapor barriers, thermal insulation, snow guards, ridges hips and miscellaneous accessories required for a complete water tight roofing enclosure as indicated by Contract Documents. Manufacturers of standing seam metal roof panels and manufactured metal wall panels to be the same.
- B. Related Sections include the following:
  - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking.
  - 2. Section 076200 "Sheet Metal Flashing and Trim" for flashing not part of roofing and other sheet metal work.
  - 3. Section 079200 "Joint Sealants" for field-applied sealants.
  - 4. Section 095423 "Linear Metal Ceilings" for metal soffit panels.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide manufactured roof panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.
- B. ASTM E1680 Air Infiltration: The panel system shall be tested in accordance with ASTM E1680, and meet or exceed the following performance requirements:

<u>Air Pressure</u>	<u>Air Leakage Rate</u>
20.0 PSF	0.0018 cfm per square foot of roof area

- C. ASTM E1646 Static Air Pressure Water Infiltration: The panel system shall be tested in accordance with ASTM E1646, and meet or exceed the following performance requirements:

<u>Water Volume, Air Pressure, &amp; Duration</u>	<u>Result</u>
5 Gallons/Hour per square foot of roof area and Static Pressure of 20.0 psf for 15 minutes	No Leakage

- D. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of UL 580 for 90 lbs. per square foot.
- E. ASTM 2140 Static Pressure Head Water Infiltration: The panel system, including a panel end lap condition, shall be tested in accordance Test Protocol TAS 114 Appendix G and meet or exceed the following performance criteria:

<u>Pressure Head &amp; Duration</u>	<u>Result</u>
6 Inch Static Water Head Pressure for 168 continuous hours	No Leakage

- F. Uniform Wind Uplift Load Capacity.
  1. Capacity shall be determined using defined method in accordance with ASTM E 1592, testing of sheet metal roof panels, and verified by an independent testing laboratory which has been approved and accredited by ASTM. The allowable capacity of the panel system shall be taken as the ultimate reported test value divided by the safety factory given above.
  2. The submitted ASTM E 1592 test report, as prepared by the independent testing laboratory, must show in detail the method of installation to the testing apparatus. Exposed fasteners at eave and/or rake conditions of the test specimen will be deemed unacceptable.
  3. Compliance for wind uplift will not be allowed through reports showing fastener pullout information or empirical calculations.
- G. Panel removal shall be able to be accomplished with experienced workers and special tools.
- H. **Basic Wind Speed: Code performance requirements for wind resistance of roof covering including insulation, substrate, clips, panels and all accessories shall comply with the Kentucky Building Code Section 1504 and Chapter 16 and Section 1609.3 Basic Wind Speed: 90 miles per hour (40 meters per second) when using the provisions of ASCE7-05 and 90 miler per hour (3 second wind gust).**

#### 1.4 SUBMITTALS

- A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.
- B. Shop Drawings: Show plans and layouts of panels on roofs, details of edge conditions, joints, panel profiles, supports, anchorages, trim, flashings, underlayment, closures, snow guards, and special details. Distinguish between factory- and field-assembled work. Shop drawings to be job specific with appropriate details referenced to the plans. Submittal of manufacturer's typical details will not be reviewed.
  1. Manufacturer's comments shall include extent of experience by manufacturer with each detail with this specific product under comparable conditions and point out any problems that have been encountered, as well as unique variations or details with which

experience is limited. Installer shall recommend and make any detail modifications required to insure a proper and watertight system.

2. Show roofing system with flashings and accessories in plan and elevation; sections and details at scale of 3"=1'-0".
  3. Include metal thicknesses and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations. Submittal shall include manufacturer's written comments, all fastener descriptions and spacings, sealant description and locations, bend radii, metal thicknesses and other pertinent information.
  4. Indicate relationships with adjacent and interfacing work.
  5. Shop drawings must be submitted and returned as acceptable prior to beginning field or factory fabrication.
  6. Shop Drawings are to be signed and sealed by a State Registered P.E. licensed in the state of Kentucky showing roof calculations, snow loads and uplifts.
- C. Samples for Initial Selection: Manufacturer's color charts or chips showing the full range of colors, textures, and patterns available for roof panels with factory-applied finishes.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Product Test Reports: Indicate compliance of manufactured roof panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.
- F. Panel manufacturer shall submit certification that the panels will be machine leveled during the roll forming process.
- G. Provide verification that the standing seam panels are factory roll formed and UL 90 rated. Should field forming be required, contractor shall provide UL 90 certification and factory manufacturer shall provide on site certified personnel for supervision of all field forming.
- H. Distinguish between factory and field assembly work.
- I. Submit calculations with registered engineer seal verifying roof panel(s) and attachment method(s) resist wind pressures imposed pursuant to specifications and applicable building codes.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: Engage an experienced installer who has completed metal roof panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance with 10 years minimum experience.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 699.

C. Pre-Installation Conference:

1. Conduct Pre-installation meeting at Project site before each construction activity that requires coordination with installation of preformed metal roofing system.
2. Other trades involved or affected by installation of metal roof system shall attend.
3. Review project requirements, approved submittals.
4. Review conditions under which roofing system will be installed.
5. Review progress of other construction activities and preparations for particular activity under consideration at each pre-installation conference.
6. Record significant discussions and agreements/ disagreements of each conference, along with approved schedule. Distribute record of meeting to everyone concerned, promptly, including Owner and Architect.
7. Do not proceed if conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene conference at earliest feasible date.

D. Thermal Expansion and Contraction.

1. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling or reducing performance ability.
2. The design temperature differential shall be not less than +/- 220 degrees F.
3. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.
4. Panel and seam cap configuration shall provide for the complete isolation of the sealant beads from the panel clip to prevent degradation of sealant from thermal movement cycles.
5. Panel system manufacturer shall demonstrate, by means of a report from an accredited third party testing laboratory, that the panel has been physically tested to simulate thermal expansion and contraction.

E. Source Limitations: Obtain standing seam metal roof panels through one source from a single manufacturer (to match manufactured metal wall panels).

F. OWNER PROVIDED INDEPENDENT ROOF INSPECTION SERVICES

SCHEDULE 1 - SCOPE:

- a. The owner shall provide independent third party roof inspection services. The Contractor shall coordinate and facilitate complete services for third party quality control roof inspections for all new roofing installations.
- b. Services must be as follows:
  1. Review and approval of roofer's qualifications.
  2. Review and approval of roof shop drawings and action plan.
  3. Attendance and documentation of **pre-roofing conference, post roofing inspection, periodic inspections**, directions and conclusions. Documentation shall include electronic photographs of all deficiencies.
  4. Inspection agent to be in attendance and periodic weekly inspections shall occur weekly as work progresses during roof installation. *Minimum weekly* periodic roofing progress review meeting/inspections, including all follow-up directions, and conclusions. Contractor shall be responsible for all required follow-up return

inspections including post project review visits to address failures, including scheduling and any additional inspection costs.

2. OWNER PROVIDED INDEPENDENT ROOF INSPECTOR'S QUALIFICATIONS

- a. Roof inspector must be independent and not affiliated nor not aligned with any roof mfr. roof distributor, or contractor.
  - b. Roof inspector shall have been in business a min. of 10 years and have min. 5 years experience in inspections of projects of similar size and roof system(s).
  - c. Roof inspector must at a min., have 75% of work per year providing inspection services.
  - d. Roof inspector must be RCI certified and RRC accredited.
    - 1) Roof inspector shall carry professional liability insurance, with the following minimum amount of \$500,000.00 per claim and \$1,000,000.00 aggregate per annum.
    - 2) The owner's roof inspector shall submit roof inspector's qualifications and confirmation of familiarity and experience with specified/provided roof type and manufacturer.
    - 3) Roofing contractor shall submit qualifications and references of roof inspector indicating compliance with the above requirements.
3. The **roofing contractor** is to facilitate and coordinate third party roof inspections with the Construction Manager, Owner, and Architect with notice given of meetings or inspections at least one week in advance.
4. The **roofing contractor** is to photo document each day's work including general views and **detailed** photographic views of the progress and electronically transmit to third party on a daily basis. Photo documentation shall include detail flashing conditions and items that will be concealed by future work. Roofing contractor shall provide additional photos or documentation as requested by third party inspector. Third party inspector to review photos daily and document observations, concerns, and necessary corrections to the roofing contractor, general contractor and Architect **within 24 hours**. Roofing contractor photos to be included with closeout documents via inspector, refer to "Closeout Documentation" below.
5. Repetitive faulty work performed by the roofing contractor may require additional on site visits by third party inspectors. All inspector fees/costs due to additional inspections are the responsibility of the contractor. Additional inspections may be required by the architect upon the receipt of two notices of concern provided by the third party inspector.
6. Contractor to cooperate and coordinate with a representative of the Roof Manufacturer to attend the pre-roofing conference and post roofing inspection.
7. The roofing contractor shall be responsible for coordination, review and confirmation that all corrective work is performed per roof covering manufacturer standards, for compliance with warranty requirements
8. **Warranty** commences upon substantial completion and when all deficiencies noted by manufacturer's representatives, third party inspector, and Architect are completed. If deficiencies have not been corrected by the date of substantial completion the warranty will begin upon the date the deficiency repairs are completed and have been accepted.
9. **CLOSEOUT DOCUMENTATION:** Third party inspector shall assemble and submit to the Architect, (3) three, 3 ring binders with project name clearly indicated on the binder covers, within 1 week following the completion of the roofing. The binders shall include copies of all inspection reports, a CD of inspection photographs in JPG format, and a CD of roof photo documentation from roofing contractor. Label CD's accordingly.

**Following review by the Architect, Owner and roofing contractor the binders shall be revised, if needed, and resubmitted: 1 copy for Owner record, 1 copy for Architect record and 1 copy for roofing contractor record.**

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling. All components shall be coated in cartons marked with manufacturer's name or trademark and UL90 label where applicable.
- B. Handling: Exercise care in unloading, storing, and erecting roof panels to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Trim with strippable film shall not be exposed to direct sunlight or extreme heat.
- E. Protect all materials and installations from damage by other trades.
- F. Do not allow material storage or traffic on installed panel surface.

#### 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish opening dimensions and proceed with fabricating roof panels without field measurements or allow for trimming panel units. Coordinate roof construction to ensure actual locations of structural members and to ensure opening dimensions correspond to established dimensions.

#### 1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: On Manufacturer's form, **without monetary limitation, and including basic wind speed as listed under Part 1.3 Performance requirements, Section H**, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
- C. Finish Warranty Period: 25 years from date of Substantial Completion.

- D. Special Manufacturer **watertight** warranty including roofing materials, base flashings, roofing accessories, roof insulation, fasteners, cover boards, walkway products and other components of roofing system.
- E. Watertight Warranty Period: 20 years from date of Substantial Completion.
- F. Special Panel Installer's Warranty: Panel Installer shall submit on warranty form at the end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
  - 1. Warranty Period: Two years from date of Substantial Completion.

#### 1.9 MOCK-UP SAMPLES

- A. Detail Mock-up Samples: The contractor is to provide full size, full system samples of specific details:
  - 1. Metal Valley Intersection
  - 2. Metal Ridge Intersection
  - 3. Metal Hip Ridge Intersection
  - 5. Metal Coping, Detail 7/A4.1
- B. Sample mock-ups to be a minimum of 24" x 24". Existing construction to remain that is necessary for the mock-up to be applied may be approximated. All components representing new work are to match specification and drawing requirements.
- C. Field Mock-up Samples: In addition to detail mock-up samples noted above, the contractor is to provide mock-ups of the various metal roofing installations. Mock-ups (if accepted by the Architect), may be incorporated into the final completed work. Mock-up panel to be at least five panels wide. Extend cleats, trim, etc., as required for incorporation of adjacent work. Proceed with overall work only upon mock-up approval.

#### 1.10 MANUFACTURER'S ROOF INSPECTIONS

##### 2. SCOPE:

- a. The Contractor is to provide and facilitate attendance by manufacturer's representative at each bi-monthly progress meeting and detailed inspections of ongoing work. Representative to provide detailed written and photographic report of findings and direct approving all work and repairs.
- b. Services must be as follows:
  - 1. Review and approval of roofer's qualifications.
  - 2. Review and approval of roof shop drawings and action plan.
  - 3. Attendance and documentation of **pre-roofing conference, post roofing inspection, periodic inspections**, directions and conclusions. Documentation shall include electronic photographs of all deficiencies.
  - 4. Attendance and documentation of each roofing progress review meeting/inspections, including all follow-up directions, and conclusions. Contractor shall be responsible for all required follow-up return inspections including post project review visits to address failures, including scheduling and any additional inspection costs.

2. The **roofing contractor** is to facilitate and coordinate manufacturer's representative roof inspections with the Construction Manager/General Contractor, Owner and Architect with notice given of meetings or inspections at least one week in advance.
3. The **roofing contractor** is to photo document each day's work including general views and **detailed** photographic views of the progress and electronically transmit to manufacturer's representative on a daily basis. Photo documentation shall include detail flashing conditions and items that will be concealed by future work. Roofing contractor shall provide additional photos or documentation as requested by manufacturer's representative. Manufacturer's representative to review photos daily and document observations, concerns, and necessary corrections to the roofing contractor, general contractor and Architect **within 24 hours**. Roofing contractor photos to be included with closeout documents via inspector, refer to "Closeout Documentation" below.
4. Repetitive faulty work performed by the roofing contractor may require additional on site visits by manufacturer's representative. All fees/costs due to additional inspections are the responsibility of the contractor. Additional inspections may be required by the architect upon the two notices of concern by the Architect.
5. Contractor to cooperate and coordinate with a representative of the Roof Manufacturer to attend the pre-roofing conference and post roofing inspection.
6. The roofing contractor shall be responsible for coordination, review and confirmation that all corrective work is performed per roof covering manufacturer standards, for compliance with warranty requirements
7. **Warranty** commences upon final completion **and** when all deficiencies noted by manufacturer's representatives, third party inspector, and Architect **are completed**. If deficiencies have not been corrected by the date of final completion the warranty will begin upon the date the deficiency repairs are completed and have been accepted.

## ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: <Insert name of Owner.>
  2. Address: <Insert address.>
  3. Building Name/Type: <Insert information.>
  4. Address: <Insert address.>
  5. Area of Work: <Insert information.>
  6. Acceptance Date: <Insert date.>
  7. Warranty Period: <Insert time.>
  8. Expiration Date: <Insert date.>
- G. AND WHEREAS Roofing Installer has contracted as a subcontractor to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- H. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

- I. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    - a. lightning;
    - b. peak gust wind speed exceeding **90** mph (3 sec);
    - c. fire;
    - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    - f. vapor condensation on bottom of roofing; and
    - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
  2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
  3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
  4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
  5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
  6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
  7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.
- J. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.
1. Authorized Signature: **<Insert signature.>**
  2. Name: **<Insert name.>**
  3. Title: **<Insert title.>**

PART 2 - PRODUCTS

STANDING SEAM METAL ROOF PANELS  
CORBIN PRIMARY SCHOOL ADDITION  
SCB # 1725 / BG# 18-035

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## 2.1 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
1. Three year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
  2. Three year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.

## 2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

## 2.3 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide panels by one of the following:
- a. IMETCO, series 300 (basis of design)
  - b. McElroy Metals
  - c. Centria
  - d. Merchant and Evans

## 2.4 METALS AND FINISHES

- 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 or galvalum to comply with ASTM A 792 and the following requirements:
1. Galvanized Steel Sheet: ASTM A 653, Galvalume; structural quality.
  2. Thickness: 24 ga., 0.028 inch (0.7 mm), unless otherwise indicated.
  3. Finish: Apply the following organic coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.
    - a. Fluoropolymer Kynar 500 2-Coat Coating System: Manufacturer's standard 2-coat, baked-on full strength (70% resin) fluorocarbon coating system (polyvinylidene fluoride, PVF2), applied by manufacturer's approved applicator. Coating system shall provide nominal 1.0 mil dry film thickness, consisting of primer and color coat.
      - 1) Durability: Provide coating field tested under normal range of weather conditions for a minimum of 25 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8.
      - 2) Color: To be selected by Architect from manufacturer's full range of standard Kynar colors.

## 2.5 ROOF PANEL ASSEMBLIES

- A. Standing-Seam Roof Panels: Manufacturer's standard factory-formed, standing-seam roof panel assembly designed for concealed mechanical attachment of panels to roof purlins or deck.
1. Manufactured panels in continuous lengths full length of roof surface without seams.
  2. Fabricate trim and flashings from same material as roof system.
  3. Panels to be minimum 16" o.c./maximum 18" o.c. seam spacing with min. seam height of 2 3/8" or manufacturer's standard seam height, provide continuous vinyl gasket at standing seam joint.
  4. Underside of panels to be protected by a polyester washcoat with a dry film thickness of .3 mils.
  5. Clips: Provide minimum 0.0625-inch- (1.6-mm-) thick, continuous stainless-steel or galvanized steel panel clips designed to meet negative-load requirements.
  6. Cleats: Mechanically seamed continuous cleats formed from minimum 0.0250-inch- (0.65-mm-) thick, stainless-steel or nylon-coated aluminum sheets.
  7. Configuration: Standing seams incorporating mechanically interlocked, concealed anchor clips which allow unlimited thermal movement.
    - a. Pre-painted stainless steel rivets shall be used for flashing and trim attachments; exposed screw fasteners are unacceptable, except at panel overlap (if required and approved). Exposed roof mastics and/or sealants are unacceptable and will be rejected.
    - b. Panels must be furnished in continuous lengths from ridge to eave with no overlaps unless shown on bid drawings.
  8. Seam cap: Snap-on cap shall be a minimum of 1" wide "T" shaped of continuous length up to 45 feet according to job conditions and field seamed by means of manufacturer's standard seaming machine.
    - a. Cap shall be designed to receive two (2) beads of continuous hot applied gasketing sealant during manufacturing which will not come in contact with the anchor clip.
  9. Stiffening Ribs: Located in flat of panel to minimize oil canning and telegraphing of structural members.
  10. Panel ends shall be folded up 90 degrees at ridge, headwall, and hip conditions, where applicable. No metal shall be cut or otherwise perforated at the folded end.
  11. Site Formed Panels: Panels in excess of shippable length shall be formed on-site. Site formed panels shall meet each of the following requirements:
    - a. Panels shall be formed on heavy duty factory type roll formers with no fewer than 12 forming stations to improve quality and minimize oil canning.
    - b. Panels shall be of identical profile and characteristics as factory formed panels and specimens used as the basis of performance tests.
    - c. Sealant shall be factory applied in a separate factory formed snap on cap. Site/field applied seam sealant is unacceptable. Seam caps may be shipped in 45' or less length and lap spliced over full length panels in accordance with manufacturer's system details.

- d. Site roll forming equipment shall be owned and maintained by the panel manufacturer and operated by the panel manufacturer's trained full time experienced technician. The installer must provide additional personnel to handle raw materials and finished product as necessary.
10. Concealed Standard Anchor Clips: Clips must be 16 gauge galvanized steel, ONE (1) continuous piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.
- a. Two-piece clips are NOT acceptable.
  - b. Clip design must isolate sealant in panel cap from clip to insure that no sealant damage occurs from the clip during expansion and contraction.

## 2.6 THERMAL INSULATION

- A. Roof Insulation: Class "A" for unlimited roof slope, non-combustible roof deck rigid polyisocyanurate suitable for fully adhered and mechanically attached assemblies. Refer to drawings for thicknesses.
- B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

## 2.7 UNDERLAYMENT MATERIALS

- A. Membrane: 2 layers of ice and water shield, 60 mil self-adhered elastomeric membrane under entire metal roof area as indicated on architectural drawings.

## 2.8 MISCELLANEOUS MATERIALS

- A. General: Provide materials and accessories required for a complete roof panel assembly and as recommended by panel manufacturer, unless otherwise indicated.
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
  - 1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
- C. Accessories: Unless otherwise specified, provide components required for a complete roof panel assembly including trim, copings, fascias, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
  - 1. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin-foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.
  - 2. Flashing and Trim: Prefinished Galvalume, galvanized domestic steel flashing and trim, conforming to ASTM A 446 Grade A, and ASTM A 525, longest practical lengths, of sufficient thickness to minimize oil canning, minimum 24 gage (0.0336" approximate galvanized sheet thickness without finish coating), unless otherwise noted
  - 3. Gutters, Downspouts, Boots and Crickets: All gutters, downspouts, boots and crickets attached to or draining a prefinished metal roof to be manufactured from the same finished material as the roof panels.

4. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
  5. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to seal joints in panel roofing and remain weathertight. Provide sealant recommended by panel manufacturer.
- D. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- E. Primer: Rust-inhibitive primer recommended by panel manufacturer for finish coat.
- F. Snow / Ice Guards: Prefabricated, non-corrosive units designed to be installed without penetrating metal roof panels, and complete with predrilled holes, clamps, or hooks for anchoring.
1. Panel-Mounted, Stop-Type Snow / Ice Guards: 5"x5" x 3/4" polycarbonate stops designed for attachment to panel surfaces of standing-seam metal roof panels with SB-190 adhesive or S-M adhesive tape. Clean surface and install per manufacturer's instructions.
    - a. Available Products:
      1. SnoGem Polycarbonate\* Basis-of-Design
      2. Alpine Snow Guards, Div. of Vermont Slate & Copper Services, Inc.
      2. Dynamic Fasteners
      3. Berger Bros. Co.
      4. Polar Blox
    2. Snow / Ice Guard Layout: Supplier to provide snow guards of sufficient quantity and layout to comply with local building codes and document parameters with shop drawing submittal and submitted layout plan.

## 2.9 FABRICATION

- A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel roofing.
1. Inspect roof deck to verify deck is even, smooth, sound and free of depressions, waves or projections and properly sloped.

2. Installer shall examine all substrates on which work is to be applied. Any surface not suitable for application of metal panel system shall be conveyed in writing to the Architect.
3. Do not proceed with roof panel installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordinate metal panel roofing with rain drainage work; flashing; trim; and construction of decks, parapets, walls, and other adjoining work to provide a leak proof, secure, and noncorrosive installation.
- B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.
- C. Provide horizontal layers of water shield membrane parallel to the eave. Single rows of membrane from eave to ridge with a 6-inch (150mm) minimum overlap and stagger ends.

### 3.3 PANEL INSTALLATION

- A. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  1. Field cutting exterior panels by torch is not permitted.
  2. Install panels with concealed fasteners, unless otherwise indicated.
  3. Conform to standards set forth in the SMACNA architectural sheet metal manuals.
  4. Install panels plumb, level and straight with seams and ribs parallel, conforming to the design as indicated.
  5. Install panels so that they are weathertight.
  6. Install panels without waves, warps, buckles or distortions; and allow for expansion and contraction. Exercise care in handling panels and trim to prevent surface damage.
  7. Ribbed pans will be vertically broken under ridges and hooked at the eaves to insure weathertightness.
  8. Remove masking on trim flashing immediately after installation.
  9. Hem all raw edges on flashings.
  10. Install panels over solid substrate. Install water shield membrane as noted in the drawings.
- B. Accessories: Install components required for a complete roof panel assembly including trim, fascia, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items.
- C. Gutters and Downspouts:
  1. Install prefabricated gutter in locations indicated.
  2. Position gutter sections on structural supports prior to commencing roof system installation.

3. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with standards of SMACNA Manual using continuous cleats at all exposed edges.
4. Install roofing and flashings in accordance with accepted shop drawings and manufacturer's product data, within specified erection tolerances.
5. Coordinate interface of preformed metal roofing systems with gutter system.
6. Roof Installer shall be responsible for effectively flashing to gutter system and fabricating watertight installation at gutters.
7. Flashing interface of metal roof system with continuous structural gutter and for flashing interface of metal roof system with metal wall panels shall be covered by roofing warranties issued in accordance with requirements specified.
8. Provide .250 aluminum external gutter brackets Kynar painted to match the color of the gutters placed at 48" o.c.

D. Flashing:

1. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for installation of work.
2. Allow for thermal expansion of exposed sheet metal work exceeding 15'-0" running length maximum.
3. For flashing and trim, space expansion joints maximum 10'-0" located 2'-0" from corners and intersections.
4. Conceal fasteners and expansion provisions wherever possible.
5. Fold back edges of concealed side of exposed edge to form hem.
6. Insert metal flashings into reglets, anchor with fasteners and wedges and seal joints.
7. Set sheet metal items level, true to line, and plumb.
8. Secure to wood with screws and washers.
9. Set metal already partly formed in place and fasten by means of cleats.
10. Use cleats to keep laps closed when face width exceeds 8" for 22 gage steel.

E. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.

F. Install underlayment membrane over substrate under metal roof panels, unless otherwise recommended by panel manufacturer. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under metal panels. Apply from eave to ridge in shingle fashion and lap joints a minimum of 2 inches (50 mm).

G. Install substrate over thermal insulation on entire roof surface. Attach with substrate fasteners.

1. Install substrate with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

H. Install thermal insulation in thickness indicated to cover entire roof. Comply with installation requirements in Division 7 Section "Building Insulation".

I. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.

1. Install weatherseal under ridge cap. Flash and seal panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
2. Seal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.

J. Standing-Seam Roof Panel Assembly: Fasten panels to supports with concealed clip according to panel manufacturer's written instructions.

1. Install clips at each support with self-drilling/self-tapping fasteners.
2. At end laps of panels, install tape calk between panels.

K. Installation Tolerances: Shim and align panel units 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.

### 3.4 CLEANING AND PROTECTING

- A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.
- C. Dispose of excess materials and debris from the job site.
- D. Thoroughly clean and touch-up any areas scarred during installation with a touch-up paint.
- E. To prevent rust staining on finished surfaces, immediately remove fillings caused by drilling or cutting or ends of pop rivets.
- F. Touch up exposed fasteners using paint furnished by roofing panel manufacturer and match exposed panel surface finished.

END OF SECTION 074113

## SECTION 074213.13 - FORMED METAL 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 SUMMARY

- A. Section Includes:
  - 1. Concealed-fastener, lap-seam metal wall panels.

#### 1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
  - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
  - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
  - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
  - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
  - 7. Review temporary protection requirements for metal panel assembly during and after installation.
  - 8. Review of procedures for repair of metal panels damaged after installation.
  - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
  2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.
1. Include Samples of trim and accessories involving color selection.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
  - B. Sample Warranties: For special warranties.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For metal panels to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
  - B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
  - C. 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 metal panel assembly 4'-0 high by 8'-0" long as part of the masonry assembly mockup panel., including corner, supports, attachments, 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.
    3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
  - B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
  - C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of

water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

- D. Retain strippable protective covering on metal panels during installation.
- E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

## 1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

## 1.10 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.11 WARRANTY

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

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

- a. Structural failures including rupturing, cracking, or puncturing.
- b. Deterioration of metals and other materials beyond normal weathering.

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

- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

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

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

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Ribbed-Profile, Concealed-Fastener Metal Wall Panels.: Formed with raised, trapezoidal ribs.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Imetco Latitude Series Panel LW12S-4 or comparable product by one of the following:
    - a. Centria Inc.
    - b. Firestone Building Products
    - c. Imetco
  2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
    - a. Nominal Thickness: 0.028 inch (0.71 mm).
    - b. Exterior Finish: Two-coat fluoropolymer.
    - c. Color: As selected by Architect from manufacturer's full range.
  3. Panel Coverage: 12 inches (305 mm).
  4. Panel Height: 0.875 inch (22 mm).
  5. Miscellaneous Furring: Metal Z-Furring 1 1/2" and 3" deep as indicated in drawings.

## 2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
  2. 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 panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
  2. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
  - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

## 2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are 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.
- C. Steel Panels and Accessories:
  1. Two-Coat Fluoropolymer: AAMA 621. 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. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
  2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

- a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

### 3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Shim or otherwise plumb substrates receiving metal panels.
  - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  - 3. Install screw fasteners in predrilled holes.
  - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 5. Install flashing and trim as metal panel work proceeds.
  - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  - 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
  - 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
  - 2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
  - 3. Copper Panels: Use copper, stainless-steel, or hardware-bronze fasteners.
  - 4. Stainless-Steel Panels: Use stainless-steel fasteners.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
  - 1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
  - 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.

3. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
4. Flash and seal panels with weather closures at perimeter of all openings.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof 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 (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

### 3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.13

## SECTION 075423 - THERMOPLASTIC MEMBRANE ROOFING

### PART 1 – GENERAL

#### 1.01 SECTION INCLUDES

- A. Mechanically attached system with thermoplastic roofing membrane.
- B. Cover Board
- C. Adhered system with thermoplastic roofing membrane.
- D. Insulation, flat and tapered.

#### 1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood nailers and curbs.
- B. Section 076200 - Sheet Metal Flashing and Trim: Counterflashings, reglets,.
- C. Section 221006 - Plumbing Piping Specialties: Roof drains.

#### 1.03 REFERENCE STANDARDS

- A. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2007.
- B. ASTM D 6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2006a.
- C. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2001.
- D. FM DS 1-28 - Wind Design; Factory Mutual Research Corporation; 2007.
- E. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition, with interim updates.
- F. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc.; current edition.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Convene one week before starting work of this section.
  - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

#### 1.05 SUBMITTALS

- A. See Division 01, for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, surfacing, and fasteners.
- C. Draft Warranty: Project Specific.
- D. Shop Drawings: Roof plans – min. 1/16" = 1'-0". Details indicating joint or termination conditions, conditions of interface with other materials, setting plan for tapered insulation, and mechanical fastener layout. Manufacturer's generic details shall not be submitted in lieu of specific details for job specific conditions.
- E. Samples for Verification: Submit two samples 12 x 12 inches in size illustrating

insulation and colored coating.

- F. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- G. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's/ District's name and registered with manufacturer.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 15 years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section:
  - 1. Installer to have completed a minimum (5) roof projects of similar size and scope with a successful in-service performance.
  - 1. Approved by membrane manufacturer.

#### D. MANUFACTURER'S ROOF INSPECTIONS:

##### 1. SCOPE:

- a. The Contractor is to provide and facilitate attendance by manufacturer's representative at each monthly progress meeting and detailed inspections of ongoing work. Representative to produce detailed written and photographic report of findings and direct/approve all work and repairs.
- b. Services must be as follows:
  - 1. Review and approval of roofer's qualifications.
  - 2. Review and approval of roof shop drawings and action plan.
  - 3. Attendance and documentation of **pre-roofing conference, post roofing inspection, periodic inspections**, directions and conclusions. Documentation shall include electronic photographs of all deficiencies.
  - 4. Attendance and documentation of each roofing progress review meeting/inspections, including all follow-up directions, and conclusions. Contractor shall be responsible for all required follow-up return inspections including post project review visits to address failures, including scheduling and any additional inspection costs.
- 2. The **roofing contractor** is to facilitate and coordinate manufacturer's representative roof inspections with the Construction Manager/General Contractor, Owner and Architect with notice given of meetings or inspections at least one week in advance.
- 3. The **roofing contractor** is to photo document each day's work including general views and **detailed** photographic views of the progress and electronically transmit to manufacturer's representative on a daily basis. Photo documentation shall include detail flashing conditions and items that will be concealed by future work. Roofing contractor shall provide additional photos or documentation as requested by manufacturer's representative. Manufacturer's representative to review photos

daily and document observations, concerns, and necessary corrections to the roofing contractor, general contractor and Architect **within 24 hours**. Roofing contractor photos to be included with closeout documents via inspector, refer to "Closeout Documentation" below.

4. Repetitive faulty work performed by the roofing contractor may require additional on site visits by manufacturer's representative. All fees/costs due to additional inspections are the responsibility of the contractor. Additional inspections may be required by the architect upon the receipt of two notices of concern by the Architect.
5. Contractor to cooperate and coordinate with a representative of the Roof Manufacturer to attend the pre-roofing conference and post roofing inspection.
6. The roofing contractor shall be responsible for coordination, review and confirmation that all corrective work is performed per roof covering manufacturer standards, for compliance with warranty requirements
7. **Warranty** commences upon final completion **and** when all deficiencies noted by manufacturer's representatives, third party inspector, and Architect **are completed**. If deficiencies have not been corrected by the date of final completion the warranty will begin upon the date the deficiency repairs are completed and have been accepted.

#### 1.07 WARRANTY

- A. See Division 01 - Closeout Submittals, for additional warranty requirements.
- B. Special Warranty: On Manufacturer's form, **without monetary limitation**, and including 90 mph wind speed rating, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period Failure includes roof leaks.
- C. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within 5 years after installation.
- D. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
  1. Warranty Term: **30 years**.
  2. For repair and replacement include costs of both material and labor in warranty.
  3. Exceptions NOT Permitted:
    - a. Damage due to roof traffic.
    - b. Damage due to wind of speed less than 90 mph (145 km/h), 3 sec.
  4. Warranty to include all provisions for over burden of photovoltaic system.
- E. Metal Roof Edge Warranty: Provide manufacturer's warranty agreeing to repair or replace roof edge system, covering blow-off from winds up to 150-MPH.
  1. Warranty Term: **30 years**, from date of Substantial Completion.
- F. Finish Warranty: Provide manufacturer's warranty agreeing to replace painted metal roof edging, fascia, and other components by membrane roofing system covering fade, chalking and film integrity.

1. Warranty Term: **30** years from date of Substantial Completion. (Refer to additional requirements in Independent Roof Inspection Services)
- G. Special Roof Installer's Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
1. Warranty Period: Two years from date of Substantial Completion. (Refer to additional requirements in Independent Roof Inspection Services)

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin Membrane Materials:
1. Carlisle SynTec; : [www.carlisle-syntec.com](http://www.carlisle-syntec.com).
  2. Basis of Design: Firestone Building Products Co; UltraPly Platinum: [www.firestonebpco.com](http://www.firestonebpco.com)
  3. GenFlex Roofing Systems; : [www.genflex.com](http://www.genflex.com)
  4. Versico Roofing Systems: [www.versico.com](http://www.versico.com)
  5. Johns Manville: [www.jm.com](http://www.jm.com)
  7. Substitutions: See Division 01
- B. Insulation:
1. Carlisle SynTec; : [www.carlisle-syntec.com](http://www.carlisle-syntec.com).
  2. Firestone Building Products Co: [www.firestonebpco.com](http://www.firestonebpco.com)
  3. Johns Manville: [www.jm.com](http://www.jm.com)
  4. Substitutions: See Division 01

### 2.02 ROOFING - UNBALLASTED APPLICATIONS

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over high density iso.
- B. Roofing Assembly Requirements:
1. Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E 1980.
    - a. Field applied coating may not be used to achieve specified SRI.
  2. Roof Covering External Fire-Resistance Classification: UL Class A.
  3. Factory Mutual Classification: Class I and windstorm resistance of I-90, in accordance with FM DS 1-28.
- C. Acceptable Insulation Types - Constant Thickness Application: Any of the types specified.
1. Minimum 2 layers of polyisocyanurate board, unless noted otherwise.
- D. Acceptable Insulation Types - Tapered Application: Any of the types specified.
1. Tapered polyisocyanurate board covered with uniform thickness polyisocyanurate board.

### 2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane:
1. Material: Thermoplastic polyolefin (TPO) complying with ASTM D 6878.
  2. Reinforcing: Internal fabric.
  3. Thickness: 0.080 inch (2 mm), minimum.
  4. Sheet Width: Factory fabricated into largest sheets possible.
  5. Solar Reflectance: 0.84, minimum, initial, and 0.65, minimum, 3-year, certified by Cool Roof Rating Council.
  6. Thickness Over Scrim: 0.030-inch minimum; ASTM D 4637 (optical method).
  7. Breaking Strength: 500 lbf (2.145 kN); ASTM D 751 (grab method).
  8. Elongation at Break: 30%; ASTM D 751.
  9. Tearing Strength: 146 lbf (649 N) minimum; ASTM D 751.
  10. Factory Seam Strength: 65 lbf (289 N); ASTM 751.
  11. Brittleness Point: Minus 40 deg F (-30 deg C); ASTM D 2137.
  12. Puncture Resistance: 415 lbf (1868 N); FTM 101C, method 2031.
  13. Ozone Resistance: no cracks after sample, wrapped around a 3-inch diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F (40 deg C) and an ozone level of 100 phm (100 mPa); ASTM D1149.
  14. Resistance to Heat Aging: 90% minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F (116 deg C); ASTM D 573.
  15. Water Absorption: Less than 4 percent mass change after 166 hours immersion at 158 deg F (70 deg C); ASTM D 471.
  16. Linear Dimension Change: 15%; ASTM D 1204.
  17. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane.

## 2.04 INSULATION

- A. Fiberglass-Mat Faced Gypsum Cover Board:(Contractor's Alternate Option)
1. Board Size: 24 x 48 inch (619 x 1220 mm).
  2. Board Thickness: 1/4 inch
  3. Weight: 1.1 psf
  4. Board Edges: Square.
  5. Manufacturers:
    - a. Georgia-Pacific Gypsum: DensDeck
    - b. CertainTeed
    - c. Firestone
  6. Substitutions: See Division 01
- B. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with Class 2, glass fiber-reinforced foam core and with the following characteristics:
1. Board Size: 48 x 96 inch (1220 x 2440 mm).
  1. Board Thickness: 2 inch (37.5 mm), typical.
  2. Board Thickness: 3/4 inch (19.05 mm), where indicated on drawings.
  4. Thermal Resistance: R-value of 11 min to follow updated 2014 ASTM C 1289-13e1 testing methods.
  5. Board Edges: Square.
  6. Manufacturers:

- a. Dow Chemical Co: [www.dow.com](http://www.dow.com).
  - b. GAF Materials Corporation: [www.gaf.com](http://www.gaf.com).
  - c. Firestone Building Products Co: [www.firestonebpco.com](http://www.firestonebpco.com)
  - d. Johns Manville: [www.jm.com](http://www.jm.com)
7. Substitutions: See Division 01

## 2.05 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches (150 mm) wide; self adhering.
- C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- D. Membrane Adhesive: As recommended by membrane manufacturer.
- E. Insulation Adhesive: As recommended by insulation manufacturer.
- F. Sealants: As recommended by membrane manufacturer.
- G. Walkway Pads: Type as recommended by membrane manufacturer.

## PART 3 – EXECUTION

### 3.01 INSTALLATION - GENERAL

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

### 3.02 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections,

properly sloped and suitable for installation of roof system.

- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailing strips are in place.
- G. The roof insulation may be mechanically anchored as specified. The roof membrane must be fully adhered as indicated. The total system must be anchored per manufacturer's standards to meet the specified performance requirements.

### 3.03 INSULATION - UNDER MEMBRANE APPLICATION

- A. Attachment of Insulation:
  - 1. Mechanically fasten all layers of insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
- B. Lay subsequent layers of insulation with joints staggered minimum 6 inch (150 mm) from joints of preceding layer.
- C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- D. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
- G. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches (450 mm).
- H. Do not apply more insulation than can be covered with membrane in same day.

### 3.04 HIGH DENSITY ISO APPLICATION

- A. Embed Iso in full bed of insulation adhesive in accordance with roofing and insulation manufacturer's requirements.

### 3.05 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate required by manufacturer and allow to partially dry before installing roofing membrane. Fully embed membrane in adhesive except in areas directly over or within 3 inches (75 mm) of expansion joints. Fully adhere one roll before proceeding to adjacent rolls. Do not apply bonding adhesive to splice area of roofing membrane. Contractor shall provide a fully adhered membrane as indicated.
- D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches (75

mm). Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

- E. At intersections with vertical surfaces:
  - 1. Extend membrane over cant strips and up a minimum of 4 inches (100 mm) onto vertical surfaces.
  - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Install roofing expansion joints where indicated. Make joints watertight.
  - 1. Install prefabricated joint components in accordance with manufacturer's instructions.
- H. Coordinate installation of roof drains and sumps and related flashings.
- I. Coordinate all installation with photovoltaic system.

### 3.06 FIELD QUALITY CONTROL

- A. See Division 01 - for general requirements for field quality control and inspection.
- B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

### 3.07 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.

### 3.08 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

### 3.09 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS **<Insert name>** of **<Insert address>**, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: **<Insert name of Owner.>**
  2. Address: **<Insert address.>**
  3. Building Name/Type: **<Insert information.>**
  4. Address: **<Insert address.>**
  5. Area of Work: **<Insert information.>**
  6. Acceptance Date: **<Insert date.>**
  7. Warranty Period: **<Insert time.>**
  8. Expiration Date: **<Insert date.>**
- B. AND WHEREAS Roofing Installer has contracted as a subcontractor to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
    - a. lightning;
    - b. peak gust wind speed exceeding **90** mph (3sec);
    - c. fire;
    - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    - f. vapor condensation on bottom of roofing; and
    - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
  2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
  3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
  4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the

extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

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

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

END OF SECTION 075423

## SECTION 076200 - SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.
5. Formed equipment support flashing.
6. Gutters, Downspouts, Exposed Trim, Metal Fascia and Metal Copings

- B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 074113 "Metal Roof Panels" for installation of sheet metal flashing integral with roof panels.
3. Section 074213 "Metal Wall Panels for installation of sheet metal flashing integral with wall panels.

#### 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 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

- B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Include details for forming, including profiles, shapes, seams, and dimensions.
3. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.

4. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches (1:5).

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

## 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

## 1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

## 1.7 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.

## 1.8 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 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: 5 years from date of Substantial Completion.

B. Project Installation Guarantee: Submit written agreement, signed by the Installer and Contractor, guaranteeing to correct failures in product, workmanship and watertightness for a period of 2 years from date of Substantial Completion without reducing or otherwise limiting other rights to correction which the Owner may have under the Contract Documents. Failure is

defined as faulty workmanship or product failure which leads to interruption of a watertight installation. The total system, no dollar limit guarantee, shall cover work of this section in its entirety.

## 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 SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
  - 2. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

### 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
  - 1. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 620. 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 (0.013 mm).

- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
  - 1. Finish: 2D (dull, cold rolled).

## 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 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.
  - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
  - 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
  - 4. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
  - 5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
  - 6. Fasteners for Zinc Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:
  - 1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
  - 2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- E. Elastomeric Sealant: ASTM C 920, 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 D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

#### 2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Acceptable Manufacturers: Subject to compliance with the requirements, provide products by one of the following:
  - 1. Fry Reglet Corporation
  - 2. Hickman: W.P. Hickman Co.
  - 3. Keystone Flashing Company
- B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.
  - 1. Material: Galvanized steel, 0.022 inch (0.56 mm) thick.
  - 2. 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.
  - 3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
  - 4. Accessories:
    - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
    - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
  - 5. Finish: Mill.
- C. Hanging Gutters: Fabricate hanging gutters from the following material.
  - 1. GalvanizedSteel: 0.0336 inch (22 ga.) (0.855 mm) thick.
- D. Downspouts: Fabricate downspouts from the following material.
  - 1. Galvanized Steel: 0.0217 inch (26 ga.) (0.55 mm) thick.
- E. Copings: Fabricate from the following material:
  - 1. Galvanized Steel: 0.0336 inch (22ga) (0.85mm) thick.
- F. Drip Edges: Fabricate from the following material:
  - 1. Galvanized Steel: 0.0217 inch (26 ga) (0.55 mm) thick.
- G. Equipment Support Flashing: Fabricate from the following material:
  - 1. Galvanized Steel: 0.0276 inch (24 ga.) (0.7 mm) thick
- H. Roof Penetration Flashing: Fabricate from the following material:

1. Galvanized Steel: 0.0276 inch (24 ga) (0.7 mm) thick

## 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 (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection.
  1. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- E. 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.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- H. 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.
- I. Do not use graphite pencils to mark metal surfaces.

## 2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-(2400-mm-) long sections.

Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.

1. Expansion Joints: Lap type.
2. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
3. Gutters with Girth 31 to 35 Inches (790 to 890 mm): Fabricate from the following materials:

- a. Galvanized Steel: 0.052 inch (1.32 mm) thick.

- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

1. Fabricated Hanger Style: Fig 1-35A according to SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials:

- a. Galvanized Steel: 0.022 inch (0.56 mm) thick.

## 2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch-(2400-mm-) long, but not exceeding 12-foot-(3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, solder or weld watertight. Shop fabricate interior and exterior corners.

1. Coping Profile: Fig 3-4D according to SMACNA's "Architectural Sheet Metal Manual."
2. Joint Style: Provide a 2" minimum and 4" maximum overlap with bed of sealant per SMACNA Plate 68, Alternate No. 2.
3. Fabricate from the Following Materials:

- a. Galvanized Steel: 0.040 inch (1.02 mm) thick (22 ga.).

- B. Roof Expansion-Joint Cover: Fabricate from the following materials: Shop fabricate interior and exterior corners.

1. Galvanized Steel: 0.034 inch (0.86 mm) thick (22 ga.).

- C. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick (24 ga.).

- D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick (26 ga.).

- E. Flashing Receivers: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick (26 ga.).

## 2.8 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch-(50-mm-)high, end dams. Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick (26 ga.).

## 2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick (24 ga.).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, 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 (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  5. Torch cutting of sheet metal flashing and trim is not permitted.
  6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or

corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. 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.
- E. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
  2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

### 3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
  2. Anchor and loosely lock back edge of gutter to continuous cleat.
  3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
  4. Anchor gutter with gutter brackets spaced not more than 36 inches (910 mm) apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
  5. Anchor gutter with spikes and ferrules spaced not more than 30 inches (760 mm) apart.
  6. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.
  7. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- B. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with the substrate.
- C. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches (100 mm) in direction of water flow.

### 3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

### 3.5 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 (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

### 3.7 CLEANING AND PROTECTION

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

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

END OF SECTION 076200

## SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
  - 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

#### 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

#### 1.4 COORDINATION

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

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. 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.
- C. 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.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-(102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Amweld International, LLC.
  - 2. Ceco Door; ASSA ABLOY.
  - 3. Curries Company; ASSA ABLOY.
  - 4. Deansteel Manufacturing Company, Inc.
  - 5. Fleming Door Products Ltd.; Assa Abloy Group Company.
  - 6. Mesker Door Inc.
  - 7. Republic Doors and Frames.
  - 8. Steelcraft; an Allegion brand.
  - 9. Metal Products, Inc., Corbin, Kentucky
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

### 2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
  - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

### 2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2...

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:
  - a. Type: All interior hollow metal doors and frames listed in the Door and Frame Schedule.
  - b. Thickness: 1-3/4 inches (44.5 mm).
  - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
  - d. Edge Construction: Model 1, Full Flush.
  - e. Core: Kraft-paper honeycomb.
  - f. Fire-Rated Construction: Each door assembly in a fire rated construction needs to be properly labeled per NFPA requirements.
3. Frames:
  - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
  - b. Non-Fire Rated Construction: Knocked down.
  - c. Fire-Rated Construction: Fully Welded Type.
    - 1) Fire Rating: Same as door, labeled.
4. Exposed Finish: Prime.
5. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy coated (galvannealed), manufacturer's standard coating thickness.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3...
  1. Physical Performance: Level A according to SDI A250.4.
  2. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches (44.5 mm.)
    - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
    - d. Edge Construction: Model 2, Seamless.
    - e. Core: Polystyrene.
      - 1) Thermal-Rated Doors: Provide doors fabricated with U-Value of not less than 0.50 when tested according to ASTM C 1363.
  3. Frames:
    - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
    - b. Construction: Full profile welded.

4. Exposed Finish: Prime.

## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
  1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
  2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
  3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-(9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:
  1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
  2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

## 2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
  1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
  - 1. Fire Door Cores: As required to provide fire-protection ratings indicated.
  - 2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
  - 3. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
  - 4. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
  - 5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
  - 6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 1. 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.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
  - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
      - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
      - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
      - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
      - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

- b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
      - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
      - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
      - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
    - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
  - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted hairline joints.
  - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  - 4. Provide loose stops and moldings on inside of hollow-metal work.
  - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

## 2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## 2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames 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. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - f. 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. 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 (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), 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 (3.2 mm) plus or minus 1/32 inch (0.8 mm).
    - b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
    - c. At Bottom of Door: 5/8 inch (15.8 mm) plus or minus 1/32 inch (0.8 mm).
    - d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

## SECTION 083323 - 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. Section Includes:

- 1. Insulated service doors.

- B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.
- 2. Section 111200 "Parking Control Equipment" for parking control equipment interlocked to overhead coiling doors.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.

- 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
- 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

- 1. Include plans, elevations, sections, and mounting details.
- 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
- 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
- 4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
- 5. Include diagrams for power, signal, and control wiring.

- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

- 1. Include similar Samples of accessories involving color selection.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
  - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
  - 1. Obtain operators and controls from overhead coiling door manufacturer.

#### 2.2 DOOR ASSEMBLY – Occurs at Equipment Storage and Weight Room

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Company Stormtite Model 625 Insulated Service Door or comparable product by one of the following:
    - a. Cornell Iron Works, Inc.
    - b. Overhead Door Corporation.
    - c. Raynor.
    - d. Wayne-Dalton Corp.
    - e. Cookson Company
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
  - 1. Include tamperproof cycle counter.
- C. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E 283.
- D. Curtain R-Value: 6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W).
- E. Door Curtain Material: Galvanized steel.
- F. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height.

1. Insulated-Slat Interior Facing: Metal.
  2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from hot-dip galvanized steel or aluminum extrusions and finished to match door.
- H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- I. Locking Devices: Equip door with slide bolt for padlock and locking device assembly.
1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumb turn.
- J. Manual Door Operation: Push-up operation.
- K. Curtain Accessories: Equip door with weatherseals, push/pull handles, and pull-down strap.
- L. Integral Frame, Hood, and Fascia
1. Mounting: As shown on Drawings.
- M. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
  2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

### 2.3 COUNTER DOOR ASSEMBLY – Occurs at Concessions

- A. Counter Door: Insulated coiling counter door formed with curtain of interlocking metal slats.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cornell Iron Works, Inc.
    - b. Overhead Door Corporation.
    - c. Raynor.
    - d. Wayne-Dalton Corp.
    - e. Cookson Company
- B. Operation Cycles: Door components and operators capable of operating for not less than 100,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
1. Include tamperproof cycle counter.
- C. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E 283.
- D. Curtain R-Value: 6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W).
- E. Door Curtain Material: Galvanized steel.

- F. Door Curtain Slats: Flat profile slats of 1 1/4-inch (67-mm) center-to-center height.
  - 1. Insulated-Slat Interior Facing: Metal.
  - 2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated stainless steel and finished to match door..
- H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- I. Locking Devices: Equip door with slide bolt for padlock and locking device assembly.
  - 1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumb turn.
- J. Manual Door Operation: Push-up operation.
- K. Curtain Accessories: Equip door with weatherseals, push/pull handles, and pull-down strap.
- L. Integral Frame, Hood, and Fascia
  - 1. Mounting: As shown on Drawings.
- M. Door Finish:
  - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
  - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face

## 2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
  - 1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm); and as required.
  - 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.

3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch (0.25 mm).

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

## 2.6 LOCKING DEVICES

A. 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.

B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinders standard with manufacturer.
2. Keys: Two for each cylinder.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

## 2.7 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch-(3-mm-) thick, replaceable, continuous-sheet baffle secured to inside of hood or field- installed on the header.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch-(3-mm-)thick seals of flexible vinyl, rubber, or neoprene.

B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

C. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches (2130 mm) high.

## 2.8 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless 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. (2.5 mm/m) of span under full load.

- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
  - 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.9 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 25 lbf (111 N).

## 2.10 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.11 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime and Finish: Manufacturer's standard primer, compatible with factory-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.
- E. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

### 3.3 STARTUP SERVICE

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

### 3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
  - 1. Adjust exterior doors and components to be weather-resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

### 3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 1. Perform maintenance, including emergency callback service, during normal working hours.
  - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

### 3.6 DEMONSTRATION

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

END OF SECTION 083323

## SECTION 083356 – COILING SECURITY GRILLES

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes:
  - 1. Manually operated or motor-operated coiling security grilles.
  - 2. Guides, brackets, hoods, curtain assemblies, locking devices, operators, and controls.
  - 3. Accessories, electrical connections, and mounting hardware required for a complete installation.
- B. Related Sections:
  - 1. Section 083313 – Coiling Counter Doors.
  - 2. Section 087100 – Door Hardware for coordination of locks and cylinders.
  - 3. Section 260500 – Electrical Requirements for power and control wiring.

#### 1.3 REFERENCES

- A. ASTM A36 – Carbon Structural Steel.
- B. ASTM A653 – Steel Sheet, Zinc-Coated (Galvanized).
- C. ASTM A1008/A1011 – Steel Sheet, Cold-Rolled/Hot-Rolled.
- D. ASTM A123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A153 – Zinc Coating on Iron and Steel Hardware.
- F. ASTM A276 – Stainless Steel Bars and Shapes.
- G. ASTM B221 – Aluminum Extrusions.
- H. ASTM B209 – Aluminum Sheet and Plate.
- I. ASTM D3359 – Measuring Adhesion by Tape Test.
- J. ASTM B117 – Salt-Spray (Fog) Testing.
- K. ASTM F593/F594 – Stainless Steel Fasteners.
- L. UL 325 – Door, Drapery, Gate, Louver Operators.
- M. DASMA 102 – Performance Standard for Rolling Doors.

#### 1.4 SUBMITTALS

- A. Product Data:
  - 1. Grille type, materials, finishes, slat/grille pattern, operation method.
  - 2. Operator data, control diagrams, load requirements.

- B. Shop Drawings:
  - 1. Opening sizes, clearances, headroom, wall construction.
  - 2. Mounting details and structural support requirements.
- C. Samples:
  - 1. Curtain/grille pattern sample, slat sample, finish sample.
- D. Operation & Maintenance Manuals.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer: Minimum 5 years of experience in fabrication of rolling security grilles.
- B. Installer: Factory-authorized installer with at least 3 years of experience installing coiling assemblies.
- C. Electrical Components: Listed and labeled per UL 325.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's packaging, labeled with project name and opening numbers.
- B. Protect components from moisture, deformation, and abrasion.

## 1.7 WARRANTY

- A. Provide manufacturer's standard warranty, minimum 1 year parts and labor.
- B. Operator warranty: 2 years minimum.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design: Cornell / Cornell Cookson [www.cornelliron.com](http://www.cornelliron.com)
  - 1. Overhead Door Corporation. [www.overheaddoor.com](http://www.overheaddoor.com)
  - 2. Wayne Dalton [www.wayne-dalton.com](http://www.wayne-dalton.com)
  - 3. McKeon Door [www.mckeondoors.com](http://www.mckeondoors.com)
- B. Substitutions: Per Division 01.

### 2.2 MATERIALS

- A. Curtain/Grille
  - 1. Rod-and-link pattern or specified grille pattern.
  - 2. Materials:
    - a. Aluminum extrusions per ASTM B221, or
    - b. Stainless steel rods per ASTM A276.

- B. Guides
  - 1. Formed steel per ASTM A653 or aluminum per ASTM B209.
  - 2. Wear strips and vinyl inserts to reduce noise.
- C. Bottom Bar
  - 1. Tubular or extruded aluminum with end locks.
  - 2. Optional locksets and security cylinders.
- D. Hood & Fascia
  - 1. Formed galvanized steel per ASTM A653 or aluminum per ASTM B209.

## 2.3 OPERATION

- A. Manual Push-Up (for small openings).
- B. Chain-Hoist Operation (standard for most schools).
- C. Motor Operation:
  - 1. Continuous-duty motor, UL 325 listed.
  - 2. Wall-mounted push-button station.
  - 3. Safety features:
    - a. Photoelectric sensors.
    - b. Bottom bar sensing edge.
    - c. Automatic reversal.

## 2.4 FINISHES

- A. Galvanized Steel Components:
  - 1. Zinc-coated per ASTM A653, G90.
- B. Factory-Applied Powder Coat:
  - 1. Color as selected by Architect.
  - 2. Adhesion testing per ASTM D3359.
- C. Aluminum:
  - 1. Clear anodized or color anodized.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Verify opening dimensions, substrates, structural backing, and clearances.
- B. Report conditions preventing installation.

### 3.2 INSTALLATION

- A. Install per manufacturer's instructions and approved shop drawings.
- B. Anchor securely to supporting construction.
- C. Coordinate electrical work for motorized units.
- D. Adjust guides, curtain, and operator to ensure smooth, quiet operation.

### 3.3 FIELD QUALITY CONTROL

- A. Test full operation: open, close, automatic stop/reversal, key controls.
- B. Demonstrate safety features comply with UL 325.

### 3.4 CLEANING AND PROTECTION

- A. Clean exposed surfaces.
- B. Protect installed grilles until Substantial Completion.

### 3.5 DEMONSTRATION

- A. Provide training to Owner for operation and maintenance.

END OF SECTION 083356

## SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Exterior and interior storefront framing.
  - 2. Storefront framing for window walls.
  - 3. Storefront framing for punched openings.
  - 4. Exterior and interior manual-swing entrance doors.

#### 1.3 PREINSTALLATION MEETINGS

- A. Pre-installation 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 entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  - 2. Include full-size isometric details of each vertical-to-horizontal intersection of 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 Initial Selection: For units with factory-applied color finishes.
- D. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
  - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- B. 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: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

#### 1.8 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

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

- a. Structural failures including, but not limited to, excessive deflection.
- b. Noise or vibration created by wind and thermal and structural movements.
- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- d. Water penetration through fixed glazing and framing areas.
- e. Failure of operating components.

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

- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

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

2. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:
  - a. Thermal stresses transferring to building structure.
  - b. Glass breakage.
  - c. Noise or vibration created by wind and thermal and structural movements.
  - d. Loosening or weakening of fasteners, attachments, and other components.
  - e. Failure of operating units.
- C. Structural Loads:
  1. Wind Loads: As indicated on Drawings.
  2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
  1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
  2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).
    - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
  3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
    - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).
- E. Structural: Test according to ASTM E 330 as follows:
  1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
  1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

2. Entrance Doors:
  - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
  - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
  1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- H. Energy Performance: Certify and label energy performance according to NFRC as follows:
  1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
  3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than frame 47, glass 48 as determined according to NFRC 500.
- I. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
  1. Outdoor-Indoor Transmission Class: Minimum 30.
- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
  1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
  2. Thermal Cycling: 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 (82 deg C).
    - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
    - c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

## 2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer "EnCore Framing System- 4 ½ inch and 6 inch deep with 1 ¾" sightline," depth as

indicated in drawings or as required by manufacturer to achieve heights of framing indicated without additional cost. Comparable product by one of the following:

1. EFCO Corporation.
2. Kawneer North America; an Alcoa company.
3. TRACO.
4. Trulite Glass & Aluminum Solutions, LLC.
5. Tubelite Inc.
6. Vistawall International

## 2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  1. Construction: Thermally broken.
  2. Glazing System: Retained mechanically with gaskets on four sides.
  3. Glazing Plane: Front.
  4. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
  1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    - a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
    - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
    - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
    - d. Structural Profiles: ASTM B 308/B 308M.
  2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
    - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
    - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
    - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
- E. Extruded Aluminum Subsill: manufacturer's extruded aluminum sill, sloped for positive wash, to fit under sash leg. One piece full width of opening jamb, angles to terminate at sill end. Sill to be minimum a .125 inch thick and sloped for positive wash

## 2.4 VENTING WINDOWS

- A. Aluminum Windows: Manufacturer's standard units, complying with AAMA/WDMA/CSA 101/I.S.2/A440, with self-flashing mounting fins, and as follows:
1. Window Type: Awning.
  2. Minimum Performance Class: AW.
  3. Minimum Performance Grade: 45.
  4. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 0.064-inch (1.63-mm) thickness at any location for main frame and sash members.
    - a. Thermally Improved Construction: Fabricate window units 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.
  5. Fasteners, Anchors, and Clips: Nonmagnetic stainless steel, aluminum, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners shall not be exposed, except for attaching hardware.
    - a. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.128 inch (3.26 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, spline grommet nuts.
  6. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze.
- B. Glazing: Refer to Section 088000- Glazing.
- C. Finish: Match adjacent aluminum-framed entrances and storefront finish.

## 2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Door Construction: 2-inch (50.8-mm) overall thickness, with minimum 0.188-inch- (4.8-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
  2. Door Design: Wide stile; 5-inch (127-mm) nominal width.
  3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

## 2.6 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

## 2.7 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Comply with Section 088000 "Glazing."
- C. Glazing Sealants: Comply with Section 088000 "Glazing."
- D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
  - 1. Color: Match structural sealant.

## 2.8 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
  - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.
- E. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements; where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.

## 2.9 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
  - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.
- G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.10 ALUMINUM FINISHES

- 1. As selected by the Architect from the manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

### 3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

### 3.3 INSTALLATION

#### A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

#### B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

- D. Install components plumb and true in alignment with established lines and grades.

- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

- F. Install glazing as specified in Section 088000 "Glazing."

- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

### 3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
  - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
  - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
  - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

### 3.5 MAINTENANCE SERVICE

#### A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 084113

## SECTION 088000 - GLAZING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes:

1. Glass for storefront framing and hollow metal framing.
2. Glazing sealants and accessories.

- B. Related Requirements:

1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for associated aluminum framing.
2. 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. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

#### 1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

#### 1.5 PREINSTALLATION MEETINGS

- A. Pre-installation 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 type of product.

B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.

1. Insulating glass

#### 1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For glass.

C. Preconstruction adhesion and compatibility test report.

#### 1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Install glazing in mockups specified in Section 084113 "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

#### 1.11 WARRANTY

A. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Glass Product: Subject to compliance with requirements, provide PPG Solarban 60 on Low-E product indicated or comparable product by one of the following:
1. Guardian Industries Corp.; SunGuard.
  2. Pilkington North America.
  3. PPG Flat Glass; PPG Industries, Inc.
- B. Glass Fabricators: Acceptable fabricators of Sealed Glass Units, Heat-Strengthened Glass, Tempered Glass and Spandrel Glass:
1. Oldcastle Building Envelope
  2. Glenny Glass
  3. Trulite Glass and Aluminum Solutions, LLC
  4. Viracon, Inc.
- C. 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.
- D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
1. Design Wind Pressures: As indicated on Drawings.
  2. Design Snow Loads: As indicated on Drawings.
  3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
  4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
  5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. 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 insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

2. 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).
3. 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.
4. 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: "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. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
  1. Minimum Glass Thickness for Exterior Lites: 6 mm.
  2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
  1. Ultra-Clear (Low Iron) Float Glass with minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

## 2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
  1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.

2. Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.6 GLAZING SEALANTS

### A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Field-applied sealants shall have a VOC content of not more than 250 g/L.
4. Sealants shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

### B. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. BASF Corporation; Construction Systems.
  - b. Dow Corning Corporation; DOW CORNING® 999A SILICONE GLAZING SEALANT.
  - c. GE Construction Sealants; Momentive Performance Materials Inc; SCS1000 Contractors.
  - d. Sika Corporation; Sikasil-GP.

## 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 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

### B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- 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 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep systems.
  - 3. Minimum required face and edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
  - 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 (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.8 INSULATING GLASS SCHEDULE

- A. Glass Type: Low-E-coated, insulating glass.
  - 1. Basis-of-Design Product: PPG Solarban 60 on Solar Gray Low E #2.
  - 2. Overall Unit Thickness: 1 inch (25 mm).
  - 3. Minimum Thickness of Each Glass Lite: 1/4 inch.
  - 4. Outdoor Lite: Clear fully tempered float glass.
  - 5. Interspace Content: Air.
  - 6. Indoor Lite: Clear annealed float glass.
  - 7. Low-E Coating: Sputtered on second surface.
  - 8. Winter Nighttime U-Factor:.29 maximum.
  - 9. Summer Daytime U-Factor:.27 maximum.
  - 10. Visible Light Transmittance: 35 percent minimum.
  - 11. Solar Heat Gain Coefficient:.25 maximum.

END OF SECTION 088000

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
  - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
- B. Related Requirements:
  - 1. Section 061600 "Sheathing"

#### 1.3 ACTION SUBMITTALS

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

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

#### 2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
  - 1. Steel Studs and Runners:

- a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
  - b. Depth: As indicated on Drawings.
- 2. Dimpled Steel Studs and Runners:
  - a. Minimum Base-Metal Thickness: 0.025 inch (0.64 mm).
  - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide the following:
  - 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Blazeframe Industries; Bare Slotted Track (BST/BST 2).
      - 2) Fire Trak Corp.
      - 3) Metal-Lite; The System.
- D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
  - 1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
  - 2. Depth: 7/8 inch (22.2 mm).

## 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-(1.59-mm-) diameter wire, or double strand of 0.048-inch-(1.21-mm-)diameter wire.
- B. Hanger Attachments to Concrete:
  - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
    - a. Type: Postinstalled, expansion anchor.
  - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

## 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
  - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

### 3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
  - 2. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.

- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
  - 3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
  - 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
  - 1. Screw to wood framing.
  - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

### 3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Hangers: 48 inches (1219 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension

system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

- a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  4. Do not attach hangers to steel roof deck.
  5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
  7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

## 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.
2. Tile backing panels.

- B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

#### 1.3 ACTION SUBMITTALS

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

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform 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 paper-faced gypsum panels 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. American Gypsum
  - 2. CertainTeed Corporation
  - 3. Georgia-Pacific Building Products
  - 4. National Gypsum Company
  - 5. United States Gypsum Company
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
  - 1. Thickness: 1/2 inch (12.7 mm) and 5/8 inch (15.9 mm).
  - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
  - 1. Thickness: 5/8 inch (15.9 mm).
  - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
  - 1. Thickness: 1/2 inch (12.7 mm) and 5/8 inch (15.9 mm).
  - 2. Long Edges: Tapered.
- E. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 2.
  - 1. Core: 5/8 inch (15.9 mm), Type X.
  - 2. Long Edges: Tapered.
  - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- F. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.4 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. American Gypsum; FireBloc® Type C Gypsum Wallboard.
  - b. CertainTeed Corporation; ProRoc Type C.
  - c. Georgia-Pacific Building Products; Gold Bond Brand Fire-Shield C Wallboard.
  - d. Lafarge North America Inc; Firecheck Type C.
  - e. National Gypsum Company; Gold Bond Fire-Shield C.
  - f. United States Gypsum Company; Firecode C Core.
2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
3. Long Edges: Tapered.

## 2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. CertainTeed Corporation; FiberCement BackerBoard.
  - b. Custom Building Products; EasyBoard.
  - c. National Gypsum Company; PermaBase BRAND Cement Board.
  - d. United States Gypsum Company; DUROCK Cement Board.
2. Thickness: 1/2 inch (12.7 mm).
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
  - a. Cornerbead.
  - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
  - c. L-Bead: L-shaped; exposed long flange receives joint compound.
  - d. Expansion (control) joint.

- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

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

- a. Fry Reglet Corporation.
  - b. Gordon, Inc.
  - c. Pittcon Industries.
- 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
  - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

## 2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use 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 setting-type, sandable topping compound.
  - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
  - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

## 2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Grabber Construction Products; Acoustical Sealant GSC.
    - b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
    - c. United States Gypsum Company; SHEETROCK Acoustical Sealant.
- E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, 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 ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-(6.4- to 9.5-mm-)wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-(6.4- to 12.7-mm-)wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
  - H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
  - I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
  - J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
  - K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  1. Wallboard Type: As indicated on Drawings.
  2. Type X: As indicated on Drawings.
  3. Ceiling Type: As indicated on Drawings.
  4. Abuse-Resistant Type: As indicated on Drawings.
  5. Moisture- and Mold-Resistant Type: As indicated on Drawings.
  6. Type C: Where required for specific fire-resistance-rated assembly indicated.
- B. Single-Layer Application:
  1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

### 3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.5 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. Interior Trim: Install in the following locations:
  1. Cornerbead: Use at outside corners.
  2. LC-Bead: Use at exposed panel edges.
  3. L-Bead: Use where indicated.
- C. Aluminum Trim: Install in locations indicated on Drawings.

### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  2. Level 2: Panels that are substrate for tile.
  3. Level 4: At all occupiable locations, unless noted otherwise on drawings..
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

### 3.7 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.

### 3.8 GYPSUM BOARD FINISH LEVEL DEFINITIONS (PER ASTM C 840 AND GYPSUM ASSOCIATION STANDARD)

- A. Level 0
  1. This level requires no taping, finishing, or corner beads.
- B. Level 1
  1. All interior angles and joints should have tape set into joint compound. The surface should be free of excess joint compound. Ridges and tool marks are acceptable. At this level, fasteners are not necessarily covered.
- C. Level 2
  1. At this level, all interior angles and joints should have tape embedded in joint compound and wiped with a trowel or joint knife, leaving a thin coating of compound. Fastener heads, corner beads, and other accessories are covered with a coat of joint compound. Ridges and tool marks are acceptable, but the surface should not have excess joint compound. If joint compound is applied over the tape when it is embedded, this is considered a separate coat of compound to satisfy the requirements of this level. Typically applies to tile substrate, where appearances are not important.
- D. Level 3
  1. All joints and interior angles should have tape that's embedded in joint compound plus one additional coat of joint compound. Accessories and the heads of fasteners must be covered with two separate coats of joint compound. All joint compound must be smooth and free of ridges and tool marks. For Level 3 and above, the prepared surface should

be coated with a drywall primer that's compatible with the wallcovering, paint, or other decoration being applied to it.

E. Level 4

1. All joints and interior angles should have tape that's embedded in joint compound plus two separate coats of compound over all flat joints and one separate coat over interior angles. Accessories and fastener heads are covered with three separate coats of joint compound. All joint compound is smooth and free of ridges and tool marks.

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 ACTION SUBMITTALS

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

#### 1.4 CLOSEOUT SUBMITTALS

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

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
  - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

#### 1.6 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.

## 1.7 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. Smoke-Developed Index: 450 or less.

### 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 (400 mm) away from test surface according to ASTM E 795.
- E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

### 2.3 ACOUSTICAL PANELS Type ACT-A

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong "Fine Fissured" or comparable product by one of the following:
  1. Armstrong World Industries, Inc.
  2. Chicago Metallic Corporation.
  3. United States Gypsum Company.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
  1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
- C. Color: White.
- D. LR: Not less than 0.80.
- E. NRC: Not less than 0.55.
- F. CAC: Not less than 30.
- G. Edge/Joint Detail: Tegular Edge.
- H. Thickness: 5/8 inch (15 mm).
- I. Modular Size: 24 by 24 inches (610 by 610 mm).
- J. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

### 2.4 ACOUSTICAL PANELS – TYPE ACT-B

- A. Panel Characteristics: Vinyl clad gypsum board. Gypsum board with sealed edges, formulated especially for ceiling application in humid or exterior environments.
  1. Modular Size: 24 by 24 inches
  2. Thickness: 5/8 inch
  3. Finish: Unperforated vinyl film.
  4. Color: White
  5. Light Reflectance Coefficient: Not less than 0.75
  6. CAC: Not less than 40

7. Products with properties specified, which are comparable in appearance to the following, will be considered:
  - a. Series: Armstrong Ceramaguard panels laminated vinyl surface, or approved equal.

## 2.5 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.
    - a. Type: Postinstalled expansion anchors.
  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.
- D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.
- G. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and

openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Provide at full perimeter of ceiling for all spaces receiving suspended ceiling.

## 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. Suspend ceiling hangers from building's structural members and as follows:
  1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for

- substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  7. Do not attach hangers to steel deck tabs.
  8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
  10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  2. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
  3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

### 3.4 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 095423 - LINEAR METAL CEILING PLANKS WITH REVEAL

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Extruded aluminum linear ceiling planks with reveal.
- B. Accessories for ceiling installation.

#### 1.2 SUBMITTALS

- A. Product Data: Manufacturer's technical data sheet and installation instructions for each type of ceiling plank required.
- B. Shop Drawings: Submit shop drawings, including details, for all ceilings. Coordinate ceiling layout, installation, and suspension system components with construction elements that penetrate ceilings or are supported by them. Show overall layout with dimensions and details for penetrations and intersections with other materials or building components.
- C. Samples: Submit three (3) full size samples of each plank type required.
- D. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.
- E. Test Reports: Upon request, submit certified test reports from recognized test laboratories.

#### 1.3 MAINTENANCE MATERIAL

- A. Extra Stock Materials:
  - 1. Deliver no less than two percent (2%) of each type, color and pattern of material.
  - 2. Extra materials shall be from the same production run as the original materials.
  - 3. Extra materials shall remain in the manufacturer's original packaging and given to the building owner upon substantial completion of the work. Store extra materials per instructions as described in storage and handling requirements.

#### 1.4 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturers: Provide linear metal ceilings planks with reveal from a single manufacturer.
  - 2. Installers: Utilize an installer having demonstrated experience on projects of comparable size and complexity.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
  - 1. Deliver material in the manufacturer's original, unopened, undamaged containers with identification labels intact.
  - 2. Handle products carefully to avoid damage.
  - 3. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

## 1.6 SITE CONDITIONS

### A. Ambient Conditions:

1. Maintain ambient temperature and humidity conditions at levels indicated for the project when occupied for its intended use.
2. Do not install products under environmental conditions outside manufacturer's recommended limits.

### B. Existing Conditions: Do not install linear metal ceiling planks until space is enclosed and weather proofed, wet work is completely dry, and work above ceiling is complete.

## 1.7 WARRANTY

### A. Provide manufacturer's written product warranty per Section 01 77 00 – Closeout Procedures.

## PART 2 PRODUCTS

### 2.2 MANUFACTURERS

#### A. Basis-of-Design Product:

1. ASI Architectural, 123 Columbia Court N, Chaska, MN 55318.  
Phone: 888-258-4637. Fax: 952-448-2613. Website: [www.asiarchitectural.com](http://www.asiarchitectural.com)

#### B. Substitutions: As approved by the Architect during the Bidding Phase.

### 2.3 DESCRIPTION

#### A. Product Description: Alumiline linear metal ceiling planks with reveal as manufactured by ASI Architectural.

#### B. Product Options: For each item listed below, please select one (1) option from the choices.

1. Construction: Extruded aluminum linear plank sections
2. Finish: Anodized
3. Finish Color: To match architect sample
4. Plank Width: 5-1/4"
5. Reveal Width: 3/4"
6. Plank Length: 10'

### 2.4 ACCESSORIES

#### A. Attachment hardware for ceiling planks as specified by manufacturer for installation.

#### B. Spline for alignment.

#### C. Class A FR MDF blocking.

#### D. Accessories with Options: Select one (1) option from the choices for each of the following accessories.

1. ABS – (Exterior) Filler strip.
2. Acoustical backer: 1" x 24" x 48". Black.
3. F-Channel vertical trim: 3/4" x Custom. F-Channel vertical trim finish to match finish of ceiling planks.

## PART 3 EXECUTION

### 3.1 EXAMINATION

#### A. Verification of Conditions:

1. Inspect installation area and conditions under which work is to be performed for compliance with all manufacturers' environmental requirements.
2. All wet work in the installation area must be complete, cured, and dry prior to installation.
3. Work above ceilings shall be complete, inspected, and accepted before ceiling work begins.

### 3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of ceiling planks and industry standards.
- B. Coordinate the exact size, location, and sequencing of penetrations of ceiling planks by all building components.
- C. Lay out ceiling pattern per approved shop drawings if required. Where not otherwise indicated, lay out planks so margins on opposite sides of rooms are equal or greater than half (1/2) the plank width.
- D. Where ceilings of different heights abut, install acoustical material matching ceiling at vertical surface of ceiling break to match ceiling.

### 3.3 ADJUSTING

- A. Adjust planks after installation so that surfaces are aligned, flush, and level with gaps between units consistent in width and straight.

### 3.4 CLEANING

- A. Clean surfaces of ceiling planks per manufacturer's instructions.
- B. Remove and replace damaged or discolored material and material that cannot be properly cleaned.

### 3.5 PROTECTION

- A. Protect installed work from damage due to subsequent construction activity, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by the owner.

END OF SECTION

## SECTION 096466 WOOD FLOORING

### Part 1-GENERAL

#### 1.1 DESCRIPTION

##### A. Related work specified under other sections:

1. Section 003300: Concrete and Concrete Finishing
  - a. Concrete Slab Depression: 2 1/4" (57mm) using 25/32" (20mm) flooring
  - b. Surface Finish: steel troweled and finished smooth.
  - c. Concrete Tolerance: 1/8" (3mm) in radius of 10' (3m).
  - d. Compressive Strength: Concrete shall be a minimum of 3,000 psi (21 MPa) and a maximum of 4000 psi (28MPa) compressive strength after 28 days. Concrete shall be free of washed river gravel, pea gravel, flint or hardener additives. No lightweight concrete.
  - e. Floor Flatness and Floor Levelness (FF and FL) numbers are not recognized.
2. Section 007100: Membrane Waterproofing and Dampproofing.
  - a. Concrete subfloors on or below grade shall be adequately waterproofed beneath the slab and at the perimeter walls and on the earth side of below grade walls by general contractor using suitable type membrane.
  - b. Sand-Poly-Sand slab construction is not an acceptable construction.
3. Section 008700: Thresholds
4. Section 116623: Gymnasium Equipment for game standards inserts.

#### 1.2 QUALITY ASSURANCE

##### A. Floor System Manufacturer Qualifications

1. Manufacturer shall be an established firm experienced in field and have been in business or a minimum of ten (10) years.
2. Manufacturer will be a member in good standing of the Maple Flooring Manufacturers Association (MFMA).

##### B. Floor Contractor/Installer Qualifications and Certifications

1. Flooring contractor shall be a firm experienced in flooring field and approved by manufacturer.
2. Submit a list of at least three completed projects of similar magnitude and complexity.

##### C. Surface Appearance (Available option)

1. Expansion spaces will not exceed 1/64" (0.4mm) at time of installation and will be spread evenly across the floor with each row of flooring.
2. Expansion spacing will be installed to allow for normal expected increases in Equilibrium Wood Moisture Content (EMC).

#### 1.3 SUBMITTALS

##### A. Manufacturer's Product Data

1. Submit three (3) specification sheets.
2. Suppliers shall submit certificates attesting that materials furnished will meet specifications for grade, quality, dryness and treatment, if required.

##### B. Concrete Guidelines

1. Submit three (3) copies of MFMA Recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive wood flooring.

##### C. Samples

1. Submit one (1) sample of the full floor system. Sample to be made by the manufacturer and so indicated.

##### D. Maintenance Literature

1. Submit copy of Maintenance Instructions.

#### 1.4 DELIVERY, STORAGE AND HANDLING

#### A. Delivery of Materials

1. Materials shall not be delivered, stored or installed until all masonry, painting, plastering tilework, marble and terrazzo work is complete, and all overhead mechanical work, lighting, backstops, scoreboards are installed. Room temperature of 55-80 degrees Fahrenheit (13 to 27 degrees Celsius) and relative humidity of 35-50 % are to be maintained. Ideal installation/storage conditions are the same as those that will prevail when building is occupied.
2. Materials shall not be stored at the installation location if the moisture content of the concrete slab exceeds 4% or vapor transmission exceeds 4.5 pounds per 1,000 square feet (2.20 kg per 100 square meters).

#### 1.5 JOB CONDITIONS-SEQUENCY

- A. Do not install floor system until concrete has been cured 60 days and the requirements in paragraph 1.04 A are obtained.
- B. General Contractor is responsible to ensure slab is clean and free of all dirt and debris prior to floor installation beginning.
- C. Permanent heat, light and ventilation shall be installed and operating during and after installation. Maintain a temperature range of 55 to 80 degrees Fahrenheit (13 to 27 degrees Celsius) and a relative humidity range of 35 to 50%. Consult MFMA guidelines for further information.
- D. After floors are finished, area to be kept locked by general contractor to allow curing time for the finish. If after required curing time general contractor or owner requires use of gym, he shall protect the floor by covering with non-fibered kraft paper or red rosin paper with taped joints, until acceptance by owner (or owner's agent) of complete gymnasium floor.

#### 1.6 GUARANTEE

- A. Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive dryness or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.
- B. Manufacturer warrants the entire flooring system to be free from manufacturing defects for a period of 1 year. This warranty is in lieu of all other warranties, expressed or implied including but not limited to any warranty of merchantability or fitness for a particular purpose, and of any other obligations on the part of the manufacturer. In the event of breach of any warranty, the liability of the manufacturer shall be limited to repairing or replacing the entire flooring system components supplied by the manufacturer and proven to be defective in manufacture, and shall not include any other damages, either direct or consequential.

### Part 2-PRODUCTS

#### 2.1 MATERIALS

##### A. Vapor Barrier

1. 6-mil polyethylene
  - a. Options:
    - 1) Moisture Suppression System for projects with high concrete moisture.

##### B. Subfloor

- a. Continuous panel subfloor with continuously fused resilient pad.

##### C. Maple Flooring Manufacturers Association (MFMA) Wood Flooring:

1. 25/32" (20mm) thick x 2 1/2", 2nd & Better grade, Unfinished with Factory Sanded Advantage™ XL option as acceptable option, TGEM, KD Northern Hard MAPLE, Continuous Strip.
2. Basis-of-Design Product: "UniMax100" Flooring as manufactured by Robbins and graded in accordance with MFMA-FJ rules.
3. Grade: 2<sup>nd</sup> and Better
  - a. Alternate #6:

1. 1st Grade

3. Substitutions: As approved in writing by the Architect during the bidding phase.

- D. Robbins Miracle or approved equal oil-modified polyurethane sealer and finish.
- E. Gameline paint(s) shall be recommended by the finishing materials manufacturer, and must be compatible with the finish.
- F. Perimeter Base - 3" x 4" ventilating type, black.

### Part 3-EXECUTION

#### 3.01 INSPECTION

- A. Inspect concrete slab for proper tolerance and dryness, and report any discrepancies to the general contractor and architect in writing. Slab will be level to within 1/8" (3mm) in a 10' (3m). Moisture content of the concrete slab shall not exceed 4% or vapor transmission exceeds 4.5 pounds per 1,000 square feet (2.20 kg per 100 square meters).
- B. All work required to put the concrete subfloors in acceptable condition shall be the responsibility of the general contractor.
- C. Subfloor shall be broom cleaned by general contractor.
- D. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

#### 3.02 INSTALLATION

- A. Vapor Barrier
  - 1. Install polyethylene with joints lapped a minimum of 6" (150mm) and turned up 4" (100mm) at the walls.
- B. Subfloor
  - 1. Install per manufacturer's recommendations.
- C. Maple Flooring
  - 1. Machine nail maple finish flooring 10" to 12" (150mm to 200mm) O.C. with end joints properly driven up and proper spacing provided for humidity conditions in specific regions. Consult your local Robbins "Certified" contractor. Provide 2" (50mm) expansion voids at the perimeter and at all vertical obstructions. OPTION: (Specify or Delete) Expansion rows will be evenly distributed with each row of flooring, with each space not exceeding 1/64" (0.4mm).

#### 3.03 FINISHING

- A. Sanding
  - 1. Sand per manufacturer's recommendations.
  - 2. After sanding, buff entire floor using 100 grit screen or equal grit sandpaper, with a heavy-duty buffing machine.
  - 3. Inspect entire area of floor to insure the floor presents a smooth surface without drum stop marks, gouges, streaks or shiners.
  - 4. Vacuum and/or tack floor before first coat of seal.
  - 5. Floor should be clean and completely free of dirt and sanding dust.
- B. Finishing
  - 1. Gymnasiums:
    - a. Apply specified combination of seal, gameline paint, and finish in accordance with manufacturer's instructions.
    - b. Buff and vacuum and/or tack between each coat after it dries.
    - c. Apply game lines accurately after the buffing and vacuuming the coated surfaces. Layout in accordance with drawings. For game lines, use current rules of association having jurisdiction. Lines shall be straight with sharp edges in colors selected by architect.

#### 3.04 WALL BASE INSTALLATION

- 1. Install Robbins vent cove base anchored to walls with base cement or screws and anchors. Use pre-molded outside corners and neatly mitered inside corner.

### 3.05 CLEANING

1. Clean up all unused materials and debris and remove it from the premises.

END OF SECTION 096466

## SECTION 096513 - RESILIENT BASE AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Resilient base.
  - 2. Resilient molding accessories.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of product indicated.

#### 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 (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

#### 1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Coordinate mockups in this Section with mockups specified in other Sections.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

#### 1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), 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 (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 THERMOPLASTIC-RUBBER BASE.

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
  2. Flexco
  3. Burke Mercer Flooring Products
  4. Nora Systems, Inc.
  5. Roppe Corporation, USA
  6. Musson Rubber Co.
  7. Johnsonite; A Tarkett Company
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
1. Group: I (solid, homogeneous).
  2. Style and Location:
    - a. Style B, Cove: Provide in areas with resilient flooring.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm).
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Preformed.
- H. Colors: As selected by Architect from full range of industry colors.

### 2.2 RUBBER MOLDING ACCESSORY.

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Refer to list of approved manufacturers in section 2.1.A
- B. Description: Rubber nosing for carpet, reducer strip for resilient flooring, and transition strips..

- C. Profile and Dimensions: As indicated.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: As selected by Architect from full range of industry colors.

### 2.3 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.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
  - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
    - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

- b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum horizontal surfaces thoroughly.
  - 3. Damp-mop horizontal surfaces to remove marks and soil.

- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

## SECTION 096723 - RESINOUS FLOORING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. High-performance resinous flooring systems.

- B. Related Sections:

- 1. Section 079200 "Joint Sealants" for sealants installed at joints in resinous flooring systems.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.
- C. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
  - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Basis of Design: Dex-O-Tex Colorflake L as manufactured by Crossfield Products Corp.
  - 2. Duraflex
  - 3. BASF
  - 4. Degussa Building Systems

### 2.2 HIGH-PERFORMANCE RESINOUS FLOORING

- A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, high-performance-aggregate-filled, resin-based, monolithic floor surfacing designed to produce a seamless floor and cove base where indicated on drawings..
- B. System Characteristics:
  - 1. Color and Pattern: As selected by Architect from manufacturer's full range.
  - 2. Wearing Surface: Textured for slip resistance.
  - 3. Overall System Thickness: 3/16 inch (4.8 mm).
- C. Primer Coat:
  - 1. Resin: Epoxy Urethane
  - 2. Application Method: Per manufacturer requirements.
    - a. Number of Coats: 1 for non-porous concrete; a second coat is required if the first coat is absorbed by the concrete.
- D. Body Coats:
  - 1. Resin: Epoxy Urethane
  - 2. Application Method: Self-leveling slurry.
    - a. Number of Coats: Two.
  - 3. Aggregates: Manufacturer's standard.
- E. Topcoat: Sealing or finish coats.

1. Resin: Aliphatic Polyester Urethane
2. Type: Clear.
3. Finish: Matte.
4. Number of Coats: Two.

F. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 9,000 psi per ASTM D 695.
2. Tensile Strength: 1,200 psi per ASTM D 638.
3. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch (1.6-mm) permanent indentation per MIL-D-3134.
4. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch (1.6 mm) per MIL-D-3134.
5. Flammability: Self-extinguishing per ASTM D 635.
6. VOC < 100 g/L

## 2.3 ACCESSORIES

- A. Primer: Type recommended by manufacturer for substrate and body coats indicated.
- B. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
  1. Roughen concrete substrates as follows:
    - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
  2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
  3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
    - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab area in 24 hours.

- b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
  - c. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

### 3.2 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
  - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
  - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
  - 3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
  - 1. Integral Cove Base: 6 inches high.
- D. Apply self-leveling slurry body coats in thickness indicated for flooring system.
- E. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.
- F. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

### 3.3 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

## SECTION 099113 - EXTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
  - 1. Steel.
  - 2. Galvanized metal.
- B. Related Requirements:
  - 1. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

#### 1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

## 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Coronado Paint, Benjamin Moore Company
  - 2. PPG Architectural Coatings.
  - 3. Sherwin-Williams Company (The)

### 2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. 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.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: As selected by Architect from manufacturer's full range.

### 2.3 METAL PRIMERS

- A. Primer, Alkyd, Anti-Corrosive for Metal: MPI #79.
  1. Sherwin-Williams (Basis of Design Kromik Universal Primer).

### 2.4 WATER-BASED PAINTS

- A. Light Industrial Coating, Exterior, Water Based (Gloss Level 3): MPI #161.
  1. Sherwin-Williams (Pro Industrial DTM Acrylic Eg Shel).

### 2.5 SOLVENT-BASED PAINTS

- A. Alkyd, Exterior, Semi-Gloss (Gloss Level 5): MPI #94.
  1. Sherwin Williams (Basis of Design DTM Alkyd Semi-Gloss).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
1. SSPC-SP 2, "Hand Tool Cleaning."
  2. SSPC-SP 3, "Power Tool Cleaning."
  3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
  4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- E. 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.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  4. Paint entire exposed surface of window frames and sashes.
  5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  - 1. Paint the following work where exposed to view:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Pipe hangers and supports.
    - d. Metal conduit.
    - e. Tanks that do not have factory-applied final finishes.

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
  - 1. Water-Based Light Industrial Coating System:
    - a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.

- b. Prime Coat: Shop primer specified in Section where substrate is specified.
- c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
- d. Topcoat: Light industrial coating, exterior, water based (Gloss Level 3), MPI #161.

2. Alkyd System:

- a. Prime Coat: Primer, alkyd, anticorrosive for metal, MPI #79.
- b. Prime Coat: Shop primer specified in Section where substrate is specified.
- c. Intermediate Coat: Exterior alkyd enamel matching topcoat.
- d. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.

END OF SECTION 099113

## SECTION 099123 - INTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates and staining and transparent finishing on wood substrates:
  - 1. Concrete.
  - 2. Concrete masonry units (CMU).
  - 3. Galvanized metal.
  - 4. Gypsum board.
- B. Related Requirements:
  - 1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
  - 2. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

#### 1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.4 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.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

#### 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Benjamin Moore & Co.
  - 2. PPG Architectural Coatings.
  - 3. Sherwin Williams Company (The)
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

## 2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. 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.
- C. Colors: As selected by Architect from manufacturer's full range.
- D. Prepare existing wood deck for new paint finish, to include removal of old paint by sanding, scraping or other means to remove existing finish and prepare for new paint. Warning! Exposure to lead dust or fumes may cause brain damage or other adverse health affects. Use proper protective equipment, such as a properly fitted respirator, and utilize proper containment and cleanup.

## 2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior: MPI #4.
  - 1. Sherwin Williams "Loxon Block Surfacer".

## 2.4 PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior: MPI #50.
  - 1. Sherwin Williams "Drywall Primer".
- B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.
  - 1. Sherwin Williams "Premium Wall & Wood Primer".

## 2.5 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: MPI #107.
  - 1. Sherwin Williams "Pro Industrial Pro-Cryl Universal Primer".

## 2.6 WATER-BASED PAINTS

- A. Latex, Interior, (Gloss Level 3): MPI #52.
  - 1. Sherwin Williams "Pro Mar 200 Zero Interior Latex Eg-Shel".

## 2.7 SOLVENT-BASED PAINTS

- A. Alkyd, Interior, Semi-Gloss (Gloss Level 4): MPI #47.
  - 1. Sherwin Williams "Pro Mar 200 Alkyd Semi-Gloss".

## 2.8 DRY FOG/FALL COATINGS

- A. Dry Fall, Latex, Flat: MPI #118.
  - 1. Sherwin Williams (Basis of Design Pro Industrial Waterborne Arcylic Dryfall).

## 2.9 FLOOR COATINGS

- A. Sealer, Solvent Based, for Concrete Floors: MPI #104.
  - 1. Sherwin Williams "H & C Decorative Concrete Sealer".

## 2.10 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
  - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
  - 2. Testing agency will perform tests for compliance with product requirements.
  - 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Gypsum Board: 12 percent.

- 5. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- 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. 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.
- G. 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 and to recommendations in "MPI Manual."
  1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. 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 Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

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. Porcelain enamel marker boards.
- 2. Vinyl-fabric-faced cork tack boards.
- 3. Visual display rails.

- B. Related Requirements:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for blocking and supports.
- 2. Section 092900 "Gypsum Board" for concealed supports in metal stud walls.

#### 1.3 ACTION SUBMITTALS

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

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

- B. Shop Drawings: For visual display units.

- 1. Include plans, elevations, sections, details, and attachment to other work.
- 2. Show locations of panel joints.
- 3. Include sections of typical trim members.
- 4. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

- C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:

- 1. Samples of facings for each visual display panel type, indicating color and texture.
- 2. Fabric swatches of fabric facings for tack boards.

- D. Product Certificates: Signed by manufacturers of tack boards certifying that vinyl-fabric-faced cork tack board materials furnished comply with requirements specified for flame-spread ratings.

#### 1.4 WARRANTY

- A. General Warranty: The special porcelain enamel chalkboard warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel chalkboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.
  - 1. Warranty Period: Life of the building.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display units to include in maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Drawings indicate size, and dimensional requirements of visual display boards and are based on the products indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 01 Section "Substitutions."
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

#### 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
  - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 50 or less.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### 2.3 VISUAL DISPLAY BOARD ASSEMBLY.

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Claridge Products and Equipment, Inc.
  - 2. Marsh Industries, Inc.
  - 3. Nelson Adams NACO
- B. Visual Display Board Assembly: factory fabricated.
  - 1. Assembly: marker board and tack board.
  - 2. Corners: Square.
  - 3. Width: As indicated on Drawings.
  - 4. Height: As indicated on Drawings.
  - 5. Mounting Method: Direct to wall.
- C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
  - 1. Color: White.
- D. Tack board Panel: Vinyl-fabric-faced tack board panel on core indicated.
  - 1. Fabric Wrapped Edge: Wrap edge of tack board panel with fabric facing.
  - 2. Color and Pattern: As selected by Architect from full range of industry colors.
- E. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-(1.57-mm-)thick, extruded aluminum; standard size and shape.
  - 1. Aluminum Finish: Clear anodic finish.
- F. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
- G. Combination Assemblies: Provide H-trim between abutting sections of visual display panels.

- H. Chalktray/ Marker Tray: Manufacturer's standard; continuous.
  - 1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.
  
- I. Display Rail: Manufacturer's standard, extruded-aluminum display rail with insert, end stops, and continuous paper holder, designed to hold accessories.
  - 1. Size: 1 inch (25 mm) high by full length of visual display unit.
  - 2. Map Hooks: Two map hooks for every 48 inches (1200 mm) of display rail or fraction thereof.
  - 3. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches (1200 mm) of display rail or fraction thereof.
  - 4. Flag Holder: One for each room.
  - 5. Aluminum Color: Match finish of visual display assembly trim.
  
- J. Visual Display Tackstrip/Rails:
  - 1. General: Manufacturer's standard, tackable visual display surface fabricated into narrow rail shape and designed for displaying material.
    - a. Width: 2".
    - a. Length/Mounting Height: As indicated on drawings.
    - b. Color/Material: Gray cork insert with aluminum frame.
    - c. Provide all end plates and any other accessories for a complete installation.

## 2.4 MARKERBOARD PANELS

- A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
  - 1. Face Sheet Thickness: 0.021 inch (0.53 mm) uncoated base metal thickness.
  - 2. Particleboard Core: 3/8 inch (9.5 mm) thick; with 0.015-inch-(0.38-mm-)thick, aluminum sheet backing.
  - 3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

## 2.5 TACKBOARD PANELS

- A. Tackboard Panels:
  - 1. Facing: 1/4-inch-(6-mm-)thick.
  - 2. Facing: Vinyl fabric.
  - 3. Facing: Vinyl fabric factory laminated to 1/16-inch-(1.6-mm-)thick cork sheet.
  - 4. Core: 3/8-inch-(9.5-mm-)thick fiberboard.

## 2.6 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

- B. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with surface-burning characteristics indicated.
- C. Hardboard: ANSI A135.4, tempered.
- D. Particleboard: ANSI A208.1, Grade M-1.
- E. Medium-Density Fiberboard: ANSI A208.2.
- F. Fiberboard: ASTM C 208 cellulosic fiber insulating board.
- G. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.
- H. Adhesives for Field Application: Mildew-resistant, non-staining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603, except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

### 3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Factory-Fabricated Visual Display Board Assemblies: Adhere to wall surfaces with egg-size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically.
- 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 (400 mm) o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.
  - 1. Mounting Height for Grades K through 3: 24 inches (610 mm) above finished floor to top of marker tray.
  - 2. Mounting Height for Grades 4 through 6: 28 inches (711 mm) above finished floor to top of marker tray.
  - 3. Mounting Height for Grades 7 and Higher: 36 inches (914 mm) above finished floor to top of marker tray.

### 3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

## SECTION 101423 - PANEL SIGNAGE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Panel signs.
  - 2. Room-identification signs.
- B. Related Requirements:

#### 1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

#### 1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel signs.
  - 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
  - 1. Include representative Samples of available typestyles and graphic symbols.

- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

#### 1.6 CLOSEOUT SUBMITTALS

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

#### 1.7 QUALITY ASSURANCE

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

#### 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of finishes beyond normal weathering.
    - b. Deterioration of embedded graphic image.
    - c. Separation or delamination of sheet materials and components.
  - 2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

#### 2.2 SIGNS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Best Sign Systems, Inc.
  - 2. Mohawk Sign Systems, Inc.

3. Seton Identification Products
4. ASI Sign Systems, Inc.
5. Contemporary Plastics, Inc.
6. Johnson Signs, Inc.
7. Fast Signs
8. Mills Manufacturing
9. Innerface
10. Dura Architectural Signage
11. Nelson Harkins
12. Cornerstone Signs
13. Signs International, Inc.
14. American Graphics, Inc.

B. Panel Sign.: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: ASI InTac.
2. Solid-Sheet Sign, Returns, and Back: Acrylic sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:
  - a. Thickness: 0.125 inch (3.18 mm).
  - b. Surface-Applied Graphics: Raised 1/32". text and graphics.
    - 1) Text: Font Helvetica Regular to meet ADA requirements.
    - 2) Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics to project 1/32" from the sign panel.
  - c. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
  - d. Mounting: Concealed fasteners and adhesive unless noted otherwise on drawings.
3. Mounting: Surface mounted to wall with concealed anchors.
4. Surface Finish and Applied Graphics:
  - a. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
  - b. Overcoat: Manufacturer's standard baked-on clear coating.
5. Text and Typeface: Accessible raised characters and Braille and Helvetica Regular. Finish raised characters to contrast with background color, and finish Braille to match background color.
6. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

### 2.3 PANEL-SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

- B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
- C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

## 2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
  - 1. Use concealed fasteners and anchors unless indicated to be exposed.
  - 2. Sign Mounting Fasteners:
    - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
  - 3. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

## 2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
  - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
  - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
  - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
  - 5. Internally brace signs for stability and for securing fasteners.
  - 6. 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. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

- C. Subsurface-Engraved Graphics: Reverse engrave back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.
- D. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.
- E. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
  - 1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
  - 2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
  - 3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. Subsequent changeable sign panels are by Owner.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

- C. Verify that anchor inserts are correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
  - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls according to accessibility standard.
- C. Mounting Methods:
  - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
  - 2. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

### 3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.

- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

## SECTION 101416 - PLAQUES

### 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 plaques.
- B. Related Requirements:
  - 1. Section 101423 "Panel Signage" for signs, with or without frames, that are made of materials other than solid metal.

#### 1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of plaque, exposed component, and exposed finish.
- C. Plaque Schedule: Use same designations specified or indicated on Drawings or in a plaque or sign schedule.
  - 1. Content of sign is to be determined at a later date. Request plaque information from School District through Sherman Carter Barnhart Architects, PLLC at least 2 months prior to fabrication.
  - 2. Submit for approval by School Board through Sherman Carter Barnhart Architects, PLLC prior to fabrication.

#### 1.5 QUALITY ASSURANCE

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

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

### 2.2 PLAQUES

- A. Cast Plaque: Plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Andco Industries Corp.
    - b. ARK Ramos Manufacturing Company, Inc.
    - c. Best Sign Systems, Inc.
    - d. Fast Signs
    - e. Nelson Harkins
    - f. Grandview Aluminum Products, Inc.
    - g. Mills Manufacturing
  - 2. Plaque Material: Cast aluminum.
  - 3. Plaque Thickness: 0.50 inch (12.7 mm).
  - 4. Finishes:
    - a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
  - 5. Background Texture: Pebble.
  - 6. Integrally Cast Border Style: Double-raised line border.
  - 7. Mounting: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.

### 2.3 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M, alloy and temper recommended by plaque manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

### 2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:
  - 1. Use concealed fasteners and anchors unless indicated to be exposed.
  - 2. Exposed Metal-Fastener Components, General:

- a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

## 2.5 FABRICATION

- A. General: Provide manufacturer's standard plaques according to requirements indicated.
  - 1. Preassemble plaques in the shop to greatest extent possible. Disassemble plaques only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
  - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
  - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
  - 5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.
  - 6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

## 2.7 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of plaque work.

- B. Verify that plaque-support surfaces are within tolerances to accommodate plaques without gaps or irregularities between backs of plaques and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
  - 2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
  - 3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
  - 4. 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.

### 3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed plaques and plaques that do not comply with specified requirements. Replace plaques 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 plaques are installed.
- C. On completion of installation, clean exposed surfaces of plaques according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain plaques in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101416

## 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. Fabricated channel dimensional characters.
  - 2. Vinyl Exterior Lettering/ Numbers.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
  - 1. Include representative Samples of available typestyles and graphic symbols.
- C. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

#### 1.4 QUALITY ASSURANCE

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

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

#### 2.2 VINYL LETTERING SIGNAGE

- A. Cut vinyl lettering rated for exterior use. Size and locations as indicated on drawings.

- B. Mounting: removable surface mount on glass.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed in this specification section 2.3.A.1.
- D. Color: As selected by Architect from Manufacturers full range of standard colors.

## 2.3 DIMENSIONAL CHARACTERS

- A. Fabricated Channel Characters.. Metal face and side returns, formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability and for securing fasteners; and as follows.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Andco Industries, Corp.
    - b. ASI Sign Systems, Inc.
    - c. Fast Signs
    - d. Best Sign Systems, Inc.
    - e. Contemporary Plastics, Inc.
    - f. Nelson Harkins
    - g. ARK Ramos Manufacturing Company, Inc.
    - h. Mills Manufacturing
  - 2. Character Material: Sheet or plate aluminum.
  - 3. Material Thickness: 1/4".
  - 4. Character Height: As indicated on drawings..
  - 5. Character Depth: 1".
  - 6. Finishes:
    - a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
  - 7. Mounting: Concealed, stainless-steel back bar or bracket assembly.
    - a. Hold characters flush to wall surface.

## 2.4 DIMENSIONAL CHARACTER 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. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

## 2.5 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.

## 2.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
  1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
  2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
  4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
  5. Internally brace signs for stability and for securing fasteners.
  6. 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.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

## 2.8 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. 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. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.

### 3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

## SECTION 102600 - WALL AND DOOR PROTECTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Corner guards.

- B. Related Sections:

- 1. Section 087100 "Door Hardware" for metal armor, kick, mop, and push plates.
- 2. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for surface-mounted corner guards.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

- B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include 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.

- C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.

- 1. Include similar Samples of accent strips and accessories involving color selection.

- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Include Samples of accent strips to verify color selected.

- 1. Corner Guards: 12 inches (300 mm) long. Include examples of joinery, corners, top caps, and field splices.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For each impact-resistant plastic material.

- B. Warranty: Sample of special warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
  - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

## 1.6 MATERIALS MAINTENANCE SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. 2 percent of each type, color, and texture of units installed, but no fewer than two, 8-foot-(2.4-m-) long units.
  - 2. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 4-foot-(1.2-m-) long units.
- B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 014000 "Quality 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.
- D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.

2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).
  - a. Store corner-guard covers in a vertical position.

#### 1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

#### 1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Deterioration of plastic and other materials beyond normal use.
  2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded material, thickness as indicated.
  1. Impact Resistance: Minimum 25.4 ft-lbf/in. (1356 J/m) of notch when tested according to ASTM D 256, Test Method A.
  2. Chemical and Stain Resistance: Tested according to ASTM D 543.
  3. Self-extinguishing when tested according to ASTM D 635.
  4. Flame-Spread Index: 25 or less.
  5. Smoke-Developed Index: 450 or less.
- B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft-lbf/in. (800 J/m) of notch when tested according to ASTM D 256, Test Method A.
- C. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 (ASTM B 221M) for Alloy 6063-T5.
- D. Stainless-Steel Sheet: ASTM A 240/A 240M.
- E. Brass: ASTM B 249/B 249M for extruded shapes and ASTM B 36/B 36 M for sheet.
- F. Particleboard: ANSI A208.1, Grade M-2.

- G. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

## 2.2 CORNER GUARDS

- A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition. **To be located at all exterior corners in the building.**
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BALCO, Inc., Type CGS-3 or approved equal.
    - b. Pawling Corporation
    - c. Construction Specialties ([www.c-sgroup.com](http://www.c-sgroup.com))
  - 2. Cover: Extruded rigid plastic, minimum 0.078-inch (2.0-mm) wall thickness; as follows:
    - a. Profile: Nominal 2-inch-(50-mm-)long leg and 1/4-inch (6-mm) corner radius.
    - b. Height: Top of guard shall be at 7'-4" above finish floor and terminate at top of resilient base..
    - c. Color and Texture: As selected by Architect from manufacturer's full range.
  - 3. Retainer: Minimum 0.060-inch-(1.5-mm-)thick, one-piece, extruded aluminum.
  - 4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
  - 5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

## 2.3 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
- D. Miter corners and ends of wood handrails for returns.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
  - 1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

### 3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
  - 1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings or, if not indicated, at heights indicated below:
    - a. Top of corner guard shall be at 7'-4" above finish floor and terminate at the top of resilient base..
  - 2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
    - a. Provide anchoring devices to withstand imposed loads.
    - b. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm).
    - c. Adjust top caps as required to ensure tight seams.

### 3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

## SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Public-use washroom accessories.
  - 2. Public-use shower room accessories.
  - 3. Custodial accessories.
- B. Related Sections:
  - 1. Section 093000 "Tiling".

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
  - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.
  - 2. Identify products using designations indicated.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 1.6 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

## 1.7 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

### 2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AJW Architectural Products
  - 2. American Specialties, Inc.
  - 3. Bobrick Washroom Equipment, Inc.
  - 4. Bradley Corporation
  - 5. GAMCO Specialty Accessories

B. Grab Bar.:

1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
  - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/4 inches (32 mm).
5. Configuration and Length: As indicated on Drawings.

C. Mirror Unit.:

1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings.
2. Frame: Stainless-steel angle, 0.05 inch (1.3 mm) thick.
  - a. Corners: Welded and ground smooth.
3. Integral Shelf: 5 inches (127 mm) deep.
4. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
  - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
  - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
5. Size: As indicated on Drawings.

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Folding Changing Table:
1. Basis-of-Design Product: Koala Kare KB310-SSWM.
    - a. Finish: Stainless steel.
- C. Hand Dryer:
1. Basis-of-Design Product: Dyson Airblade V.
    - a. Color: Sprayed Nickel.

2.4 CUSTODIAL ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Mop and Broom Holder:
1. Basis-of-Design Product: Refer to Toilet Accessory Schedule in Drawings.
  2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
  3. Length: 36 inches (914 mm).
  4. Hooks: 5.

5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No.4 finish (satin).
  - a. Shelf: Not less than nominal 0.05-inch-(1.3-mm-) thick stainless steel.
  - b. Rod: Approximately 1/4-inch-(6-mm-) diameter stainless steel.

## 2.5 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

## 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.
- B. Related Requirements:
  - 1. Section 104416 "Fire Extinguishers."

#### 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.

#### 1.4 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.

#### 1.5 SEQUENCING

- A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

### PART 2 - PRODUCTS

#### 2.1 FIRE-PROTECTION CABINET-

- A. Cabinet Type: Suitable for fire extinguisher.
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Cold-rolled steel sheet.
- D. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Steel sheet.
- G. Door Style: Fully glazed panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- 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. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
  3. Door Lock: Cylinder lock, keyed alike to other cabinets.
  4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
    - a. Identify fire extinguisher in fire-protection cabinet with the words " FIRE EXTINGUISHER."
      - 1) Location: Applied to cabinet door.
      - 2) Application Process: Silk-screened.
      - 3) Lettering Color: Red.
      - 4) Orientation: Vertical.
- K. Materials:
  1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
    - a. Finish: Baked enamel or powder coat.
    - b. Color: As selected by Architect from full range of industry colors and color densities.
  2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

## 2.2 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.

- 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 (13 mm) thick.
  - 2. Fabricate door frames of one-piece construction with edges flanged.
  - 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

### 2.3 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 semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

### 3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
  - 1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.

2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.

#### 3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to 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

## 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.
- B. Related Requirements:
  - 1. Section 104413 "Fire Protection Cabinets."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

#### 1.4 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

### 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.
  - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

#### 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

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

B. Multipurpose Dry-Chemical Type in Steel Container FE: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

### 2.3 MOUNTING BRACKETS.

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

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

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: Vertical.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

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

### 3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

## SECTION 105100 – ATHLETIC LOCKERS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. 24-inch Wide Open Access Standard Metal Lockers.

#### 1.2 REFERENCES

- A. IBC - International Building Code.

#### 1.3 RELATED SECTIONS

- A. Section 03300 – Cast-in-Place Concrete: Concrete bases.
- B. Section 061053 – Rough Carpentry: Wood ground and furring for anchoring lockers.
- C. Section 096500 – Resilient Base.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data - Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Prepared specifically for this project; show dimensions of lockers and interface with other products.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have a Quality System in place to ensure and be able to substantiate that manufactured units conform to requirements and match the approved design and must be ISO 9001:2015 certified.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Locker components shall be stored flat, if shipped unassembled, until assembly. All finishes shall be protected from soiling and damage during handling.

- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.7 WARRANTY

- A. Manufacturer's standard warranty to repair or replace components of locker products that fail in materials or workmanship within 3 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Salsbury Industries, 18300 Central Avenue, Carson, CA 90746-4008; Toll Free Telephone: 1-800-LOCKERS (1-800-562-5377); Fax: 1-800-562-5399; Email: [salsbury@lockers.com](mailto:salsbury@lockers.com); Website: [www.lockers.com](http://www.lockers.com).
- B. Substitutions: As approved by the Architect in writing during the Bidding Phase.

### 2.2 LOCKERS

24-inch wide open access standard metal lockers: Constructed of 16 gauge steel; durable powder coated finish; top compartment includes a lift up handle and recessed hasp for added security; top compartment can accommodate combination padlocks or key padlocks, and foot locker compartment can accommodate combination padlocks or key padlocks.

- A. 24-inch Wide Open Access Standard Metal Locker Models:
  - 1. 70018.
- B. Unit Width: 24 inches (610 mm).
- C. Unit Height: 72 inches (1,828 mm).
- D. Unit Depth:
  - 1. 70018: 18 inches (457 mm).
- E. Unit Assembly:
  - 1. Assembled units.
- F. Unit Color:
  - 1. Color: As selected by Architect from manufacturer's full range.

### 2.3 INTERIOR EQUIPMENT

- A. Standard Hardware Features:
  - 1. One steel recessed padlock hasp on top storage compartment door.
  - 2. One 12 inch wide x 12-1/2 inch high x 13-3/4 inch deep (305 mm wide x 318 mm high x 349 mm deep) top storage compartment.

3. Two wall-mounted, single-prong stainless steel coat hooks.
4. One stainless steel coat rod.
5. One 13-3/4 inch (349 mm) deep upper shelf.
6. One 14 inch (356 mm) high foot locker with a hinged lid, vented front panel and padlock hasp.

## 2.4 CONSTRUCTION

- A. Locker Doors: Steel specially formed for added strength and rigidity and to ensure tight joints at fastening points.
  1. Door: 16 gauge - .060 inch (1.52 mm) thick steel.
  2. Ventilation:
    - a. Top storage compartment: Solid facing.
    - b. Foot locker compartment: Ventilated facing.
  3. Single-point latching:
    - a. Top storage compartment door: Recessed handle; integral pocket and pull made of stainless steel securely fastened to door and sufficient to prevent a combination padlock, built-in combination lock, or key lock from protruding beyond door face.
    - b. Foot locker door: One-point locking device with a steel lock clip for attaching padlock.
- B. Locker Body: Solid steel specially formed for added strength and rigidity and to ensure tight joints at fastening points.
- C. Hinges:
  1. Top storage compartment door hinges: 0.074 inch (1.88 mm) thick sheet steel, double spun, full loop, tight pin, projection welded to door frame and securely fastened to compartment door; two 2 inch (51 mm) high five-knuckle hinges installed on compartment door.
  2. Foot locker door hinge: 16 gauge continuous hinge secured with rivets to door frame and to door. Hinge has 1/2 inch (12.7 mm) knuckles and 0.235 inch (5.969 mm) diameter.
- D. Optional factory assembly of locker bodies using heavy duty steel rivets.

## PART 3 EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

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

### 3.3 INSTALLATION

- A. Install in accordance with Salsbury Industries' installation instructions.
- B. Anchor the units to the wall studs through the locker back and to the floor.
- C. Lockers can be either floor-mounted or installed on concrete or wood bases as scheduled or indicated. Floor or base shall be level for proper installation.

### 3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 105100

## SECTION 105300 - ALUMINUM PROTECTIVE CANOPIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

#### 1.2 DESCRIPTION OF WORK:

- A. Extent of work includes all labor, material, equipment and related items required for the installation of "Aluminum Protective Canopies" as shown on the drawings and specified herein.

#### 1.3 QUALITY ASSURANCE:

- A. Materials and finishes shall meet or exceed recommended ASTM, Military and Federal Test methods specified by the Aluminum Association in their publication "Aluminum Standards and Data, current edition.

#### 1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's product data and installation instructions for each type of canopy specified.
- B. Samples for Initial Color Selection: Manufacturer's color charts showing a full range of available colors.
- C. Samples for Color Verification: Sample showing actual colors prepared on same material to be used for the work.
- D. Shop Drawings: Submit shop drawings for components and installation which are fully dimensioned or detailed on manufacturer's data sheets.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements, provide products of one of the following or approved equal:
  - 1. Alcan Aluminum Canopies
  - 2. Mapes Industries, Inc.
  - 3. E.L. Burns Company, Inc.
  - 4. American Aluminum Products Company.
  - 5. Perfection Metal and Supply Company.
  - 6. Peach Tree Protective Covers

- 7. Superior
- 8. Tennessee Valley Metals

## 2.2 CONSTRUCTION:

- A. Door Canopy: Louver leaves shall be .075" minimum walled aluminum with a three-inch minimum rib height, flush deck. Fascia gutter shall be a structural 7" minimum .094 walled extruded tube. Two-piece fascia shall not be accepted. Overhead supports shall be a heavy-duty extruded prefinished tube aluminum strut supports, minimum deck rib height to be 3". Galvanized steel struts will not be accepted. Downspouts to be galvanized steel: 22 gauge. Provide galvanized metal strainers at the highest end of all downspouts. Provide 16 ga galvanized steel downspout straps 1" x 2" at downspouts, Finish shall be factory applied 70% by weight Kynar resin in a custom color as selected by owner.

## 2.3 PROTECTIVE COATING:

- A. All ferrous fasteners and hanging accessories shall be heavily galvanized or cadmium plated. All louvers, gutters and fascia to be caustic etched and alumilited.

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

- A. Install canopies at locations shown in accordance with enlarged details and manufacturer's instructions for plumb, level, rigid and flush installation.

END OF SECTION 105300

## SECTION 105113 – LOCKERS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. 12-inch Wide Double-Tier Standard Metal Lockers.

#### 1.2 REFERENCES

- A. ADAAG - Americans with Disabilities Act, Accessibility Guidelines.
- B. IBC - International Building Code.

#### 1.3 RELATED SECTIONS

- A. Section 003300 – Cast-in-Place Concrete: Concrete bases.
- B. Section 061053 – Rough Carpentry: Wood ground and furring for anchoring lockers.
- C. Section 096513 – Resilient Base.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Prepared specifically for this project; show dimensions of lockers and interface with other products.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have a Quality System in place to ensure and be able to substantiate that manufactured units conform to requirements and match the approved design and must be ISO 9001:2015 certified.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Locker components shall be stored flat, if shipped unassembled, until assembly. All finishes shall be protected from soiling and damage during handling.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.7 WARRANTY

- A. Manufacturer's standard warranty to repair or replace components of locker products that fail in materials or workmanship within 3 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Salsbury Industries, 18300 Central Avenue, Carson, CA 90746-4008; Toll Free Tel: 1-800-LOCKERS (1-800-562-5377); Fax: 1-800-562-5399; Email: [salsbury@lockers.com](mailto:salsbury@lockers.com); Website: [www.lockers.com](http://www.lockers.com).
- B. Substitutions: As approved in writing by the Architect during the Bidding Phase..

### 2.2 LOCKERS

Single-tier, double-tier and triple-tier 12-inch wide standard metal lockers: Constructed of 16 gauge steel; durable powder coated finish; includes a lift up handle and recessed hasp for added security; can accommodate built-in combination locks, built-in key locks, combination padlocks, key padlocks or factory installed resettable combination locks.

- A. 12-inch Wide Standard Metal Locker Series:
  - 1. 62000 series: Double-tier.
- B. Unit Width: 12 inches (305 mm).
- C. Unit Height:
  - 1. 5 foot Lockers:
    - a. 64 inches (1,626mm) with masonry base (by others).
- D. Unit Depth:
  - 1. 18 inches (457 mm).
- E. Unit Assembly:
  - 1. Assembled units.
- F. Unit Color: As selected by the Architect from manufacturer's full range.

## 2.3 INTERIOR EQUIPMENT

- A. A. ADA-Compliant Lockers (Recessed Handles with Multi-Point Latch):
  - 1. Double-tier lockers: Additional shelf at maximum 48 inches (1,219 mm) above the floor for unobstructed forward and side reach.
  - 2. Locker Compartment Bottom: Minimum of 15 inches (381 mm) above the floor or an extra shelf placed 15 inches (381 mm) above the floor for unobstructed forward and side reach.
  - 3. Hooks and rods as specified.
  
- B. Standard Hardware Features:
  - 1. Padlock hasp.
  - 2. One top-mounted, two-pronged stainless steel coat hook.
  - 3. Three wall-mounted, single-prong stainless steel coat hooks.
  - 4. Horizontal venting.
  - 5. Five knuckle door hinges.
  - 6. Adjustable hat shelf.

## 2.4 OPTIONAL EQUIPMENT

- A. Sloping hoods.
  
- B. Base panels – 6 inches (152 mm) high:
  - 1. Front base.
  - 2. End base.
  
- C. Fillers:
  - 1. Sloping hood fillers:
    - a. Sloping in-line top fillers.
    - b. Sloping corner fillers.
  
- D. Finished end panels:
  - 1. Single end panel for end of unit rows.
  - 2. Double end panel for back-to-back unit installations.
  
- E. Additional compartment shelf.
  
- F. Locker zee base kit – 4 inches (102 mm) high by 72 inches (1828 mm) in length in same color as locker unit. Locker zee base kits shall be fabricated from 0.0625 inch (1.59 mm) thick steel sheet.
  - 1. 12 inches (305 mm).
  
- G. Lockers without legs.

- H. Anchoring Brackets - For use in locker units without legs.

## 2.5 CONSTRUCTION

- A. Locker Doors: Steel specially formed for added strength and rigidity and to ensure tight joints at fastening points.
  - 1. Door:
    - a. 16 gauge - .060 inch (1.52 mm) thick steel.
    - b. Holes provided for attaching number plates.
  - 2. Ventilation: Vents provided in manufacturers' standard louver pattern.
    - a. Double-tier lockers – 5 feet high units:
  - 3. Multi-Point Latch: Full channel formation of adequate depth to fully conceal lock bar on lock side, channel formation on hinge side, right angle formations across top and bottom.
- B. Locker Body: Solid steel specially formed for added strength and rigidity and to ensure tight joints at fastening points.
- C. Hinges: Hinge: 0.074 inch (1.88 mm) thick sheet steel, double spun, full loop, tight pin, projection welded to door frame and securely fastened to the door.
  - 1. Single-tier lockers: Three 2 inch (51 mm) high five-knuckle hinges.
  - 2. Double-tier & triple-tier lockers: Two 2 inch (51 mm) high five-knuckle hinges.
- D. Optional factory assembly of locker bodies using heavy duty steel rivets.

## PART 3 EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

### 3.3 INSTALLATION

- A. Install in accordance with manufacturers' installation instructions.
- B. Anchor the units to the wall studs through the locker back and to the floor.

### 3.4 PROTECTION

- A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 105113

## SECTION 116643 - SCOREBOARDS

### GENERAL

- 1.01 SECTION INCLUDES
  - A. Single-sided LED basketball scoreboard
- 1.02 REFERENCES
  - A. Standard for Electric Signs, UL 48
  - B. Standard for CSA C22.2 #207
  - C. Federal Communications Commission Regulation Part 15
  - D. National Electric Code
- 1.03 SUBMITTALS
  - A. Product data: Submit manufacturer's product illustrations, data and literature that fully describe the scoreboards and accessories proposed for installation.
  - B. Shop drawings: Submit mechanical and electrical drawings.
  - C. Maintenance data: Submit manufacturer's installation, operation, and maintenance manuals.
- 1.04 DELIVERY, STORAGE, AND HANDLING
  - A. Product delivered on site
  - B. Scoreboard and equipment to be housed in a clean, dry environment
- 1.05 PROJECT CONDITIONS
  - A. Environmental Limitations: Do not install scoring equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.
  - B. Field Measurements: Coordinate scoreboard location and height with the customer. Verify dimensions by field measurements.
  - C. Supply weight and mounting method for owner to verify that building structure is capable of supporting the scoreboard's weight in addition to the auxiliary equipment.
- 1.06 QUALITY ASSURANCE
  - A. For indoor use only
  - B. Source Limitations: Obtain each type of scoring equipment and electronic displays through one source from a single manufacturer.
  - C. ETL listed to UL 48
  - D. NEC compliant
  - E. FCC compliant
  - F. ETLC listed to CSA 22.2 #207
- 1.07 WARRANTY
  - A. Provide 5 years of no cost parts exchange including standard shipping on electronics parts and radios due to manufacturing defects
  - B. Provide toll-free service coordination
  - C. Provide technical online and phone support during Daktronics business hours

### PART 2 PRODUCTS

- 2.01 MANUFACTURER
  - A. Owner-Preferred Manufacturer, Refer to Alternate #5: Daktronics, Inc., 201 Daktronics Drive, P.O. Box 5128, Brookings, SD 57006-5128
  - B. Acceptable Manufacturers:

## SECTION 116643 - SCOREBOARDS

1. Varsity Scoreboards, 106 Max Hunt Drive, Murray KY 42710, (866) 394-5186.
2. Nevco Inc, 301 East Harris Avenue, Greenville, Illinois 62246; 800-851-4040; www.nevco.com.

### 2.02 PRODUCT

- A. Daktronics BB-2125 single-sided basketball scoreboard displays period time to 99:59, HOME and GUEST scores to 199, PERIOD to nine, team FOULS to 19, PLAYER number to 99, player FOUL to nine, T.O.L. (time outs left) to nine and indicates possession and bonus. During the last minute of the period, scoreboard displays time to 1/10 of a second. Scoreboard can also score volleyball, wrestling and any sport requiring a clock, score and period function.

### 2.03 SCOREBOARD

- A. General information
1. Dimensions: 4'-0" (1.22 m) high, 10'-0" (3.05 m) wide, 0'-6" (152 mm) deep
  2. Base weight: 150 lb (68 kg) – options may increase weight
  3. Base power requirement: 140 W – options may increase wattage
  4. Color: choose from manufacturer's standard paint selections
- B. Construction
1. All-aluminum construction
  2. Scoreboard back, face, and perimeter: 0.063" (1.60 mm) thick
  3. Cabinet withstands high-velocity impact from air-filled sports balls without the need for protective screens
- C. Digits & Indicators
1. LED color: Amber clock/colon, PERIOD, PLAYER/FOUL and T.O.L. digits and bonus indicators with Red score and FOULS digits and possession indicators
  2. Clock and score digits: 10" (254 mm) high
  3. PERIOD, FOULS, PLAYER/FOUL and T.O.L. digits: 7" (178 mm) high
  4. Bonus indicators: 4" (102 mm) high
  5. Possession arrows: 3" (76 mm) high
  6. Seven bar segments per digit
  7. PanaView® (PV) digit technology – discrete LEDs protrude through the scoreboard face
- D. Captions
1. Vinyl applied directly to scoreboard face
  2. HOME and GUEST captions: 6" (152 mm) high
  3. PERIOD, FOULS/SCORE, PLAYER/FOUL/MATCH and T.O.L. captions: 3" (76 mm) high
  4. Color: standard white or choose from manufacturer's vinyl color selections
- E. Border Striping
1. Vinyl striping applied around the clock and scoreboard face
  2. Color: standard white or choose from manufacturer's vinyl color selections
- F. Horn
1. Vibrating horn mounted inside the scoreboard cabinet behind the face
  2. Sounds automatically when period clock counts down to zero
  3. Sounds manually as directed by operator
- G. Power Cord
1. Cord is 11' (3.35 m) long
  2. Cord plugs into a standard grounded outlet
- H. Accessory Equipment
1. Two 6" (152 mm) high Programmable Team Name Message Centers (TNMCs) in place of vinyl HOME and GUEST captions – add 15 lb (7 kg) and 60 W]
  2. Double bonus indicators in place of single bonus indicators
  3. Advantage time option for wrestling mode – PLAYER and FOUL digits reversed

## SECTION 116643 - SCOREBOARDS

### 2.04 SCORING CONSOLE

- A. Console is an All Sport® 5000 controller
- B. Scores multiple sports using changeable keyboard inserts
- C. Controls multiple scoreboards, stats displays and shot clocks, including other All Sport 5000 controlled displays currently owned by customer
- D. Recalls clock, score, and period information if power is lost
- E. Runs Time of Day and Segment Timer modes
- F. Console includes:
  - 1. Rugged aluminum enclosure to house electronics
  - 2. Sealed membrane water-resistant keyboard
  - 3. 32-character backlit LCD to verify entries and recall information currently displayed
  - 4. Power cord that plugs into a standard grounded outlet; 6 watts max
  - 5. Control cable to connect to the control receptacle junction box (wired system only)
  - 6. Hand-held switch for main clock start/stop and horn
  - 7. Soft-sided carrying case
- G. Accessory Equipment
  - 1. 2.4 GHz spread spectrum radio system with frequency hopping technology and 64 non-interfering channels; system includes a transmitter installed inside the console and a receiver installed inside the scoreboard(s).
  - 2. Hard carrying case

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that mounting surface is ready to receive scoreboard. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings.

### 3.02 INSTALLATION

- A. Power conduit, power conductors, and signal conduit to within 3' (0.9 m) of displays will be installed by Customer. Control wiring and labor to install will be the responsibility of the contractor assigned to the display equipment. Power conduit, signal conduit, and all electrical connections from within 3' (0.9 m) of displays will be the responsibility of the contractor assigned to the display equipment.
- B. Mount scoreboards and interior displays to wall in location detailed and in accordance with manufacturer's instructions. Unit to be plumb and level.

### 3.03 INSTALLATION—CONTROL CENTER

- A. Provide boxes, cover plates and jacks as required to meet control specification requirements. Control cables to control panels shall be concealed.
- B. Test the operation of the scoreboard, controller and all control jacks; leave control unit in carrying case and other loose items with owner's designated representative.
- C. Conduct operator training on the scoreboard/controller operation.

END OF SECTION 116643

## SECTION 123216 – MANUFACTURED PLASTIC-LAMINATE-FACED-CASEWORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 - Specification sections, apply to work of this section.

#### 1.2 SUMMARY:

- A. Type, size, location and extent of cabinets, casework, reception desk, and countertops associated manufactured casework.
- B. Installation of sink units mounted in countertops is specified in a Division 15 section. At 34" height casework dim to be measured from sink rim to finish floor. Coordinate top depth as required complying with ADA.
- C. Electrical connections are specified in a Division 26 section.

#### 1.3 WORK INCLUDED:

- A. The extent of manufactured casework systems as shown on drawings, schedules, and specified herein. Where specific materials, finishes, construction details, and hardware are specified herein, the casework contractor shall be held in strict accordance. All items shall be as provided, and publicly cataloged, by one manufacturer to assure physical and dimensional integrity of the system and ready access to additional systems components for a minimum of ten (10) years after completion of this contract. Product from companies not meeting this requirement will not be accepted.
- B. Furnish all items of equipment as listed in the Specifications, Equipment Schedule and/or as shown on the drawings including delivery to the buildings, unpacking, setting in place, leveling, shimming and scribing to walls and floors as required.
- C. Stainless steel sinks and fixtures within plastic laminate tops shall be provided and installed under Division 15. (Opening to be furnished by casework supplier.)

#### 1.4 WORK NOT INCLUDED:

- A. The furnishing, installation and connection of any service lines, drain lines, traps, piping, wire and conduit within the equipment and through, under, or along the backs of working surfaces as required by the specifications and/or as shown on the drawings unless otherwise indicated. Installation of sinks and service fixtures and final connection of all services.
- B. The furnishing, installing and connecting of all vents, revents and special plumbing fixtures or piping to meet local codes, even though not specifically called for in the specifications and/or shown on the drawings.

- C. The furnishing of any framing or reinforcements for walls, floors or ceilings to support any equipment.
- D. The furnishing and installation of specified resilient base finish for all casework. This work is part of a Division 9 Section.

1.5 SYSTEM DESCRIPTION:

- A. All manufactured casework shall be pre-engineered, and cataloged, to rigid modular-matrix sizing allowing for future interchange of components, or entire units. Manufacturers submitting for approval must provide printed catalog information documenting this performance feature; no exceptions will be allowed.

1.6 QUALITY ASSURANCE:

- A. Manufacturer's products shall be publicly cataloged. Manufacturer will show evidence of a minimum of five (5) years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity and adequate facilities and personnel required to perform on this project.
- B. Any manufacturers not listed under Part 2 – Products, paragraph 2.1 Acceptable Manufacturer shall be certified by the Architectural Woodwork Institute (AWI) Quality Certification Program and register this project with AWI/OCP. Work in this section shall comply with the specified grades of work written herein and sections 400 and 1600 of the 7<sup>th</sup> edition of the Architectural Woodwork Institute Quality Standards.
- C. Manufactured casework systems must conform to design, quality of materials, workmanship and function as shown on drawing and specified herein. In the absence of a printed specification, minimum quality standards shall be in accordance with AWI Section 1600B, Sixth Edition, Version 1.1, no exceptions will be permitted; additional requirements shall be as specified herein.
- D. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.
- E. All manufactured casework shall be pre-engineered, and cataloged, to rigid modular sizing allowing for future interchange of components, or entire units. Manufacturers submitting for approval must provide printed catalog information documenting this performance feature.

1.7 SUBMITTALS:

- A. Product Data:
  - 1. In addition to the general conditions as relates to prior approvals, SUBMITTALS of manufacturer's data, installation instructions, and samples are required.

B. Samples:

1. Submit samples of casework manufacturer's standard decorative laminate colors, patterns, and textures for exposed and semi-exposed materials for architect's selection. Samples of other materials or hardware shall be made available if requested.
2. Architect may request representative full-size samples for evaluation prior to approval. Samples may be impounded by architect/owner until completion of project to ensure compliance with specifications.

C. Production Drawings:

1. Submit production drawings for casework systems and countertops showing layout, elevations, ends, cross-sections, face modular values, service run spaces and location of services.
2. Include layout of units with relation to surrounding walls, doors, windows, and other building components.
3. Coordinate production drawings with other work involved.

1.8 PRODUCT HANDLING:

- A. Deliver laminate clad casework and countertops only after wet operations in building are completed. Schedule with General Contractor.
- B. Store completed laminate clad casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 20% to 50%.
- C. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with a protective covering.

1.9 JOB CONDITIONS:

A. Humidity and Temperature Controls:

1. Advise contractor of requirements for maintaining heating, cooling, and ventilation in installation areas as required to reach relative humidity necessary to maintain optimum moisture content.

1.10 WARRANTY:

- A. Manufactured products carry a five (5) year Guaranty to the original Owner against defective material and workmanship from the date of substantial completion. This is a warranty of replacement and repair for defects in material and/or workmanship without charge.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer and Product Type: Subject to compliance with requirements, provide products of one of the following:
1. Construction features to be in accordance with TMI catalogued FIXED, FLEXIBLE & MODULAR casework that are fully modular and dimensionally integrated to allow owner interchange of doors, drawers and interior components. TMI Systems Design Corporation, 50 South Third Avenue West, Dickenson, North Dakota, 58601, [www.tmisystems.com/products/reference/index.asp](http://www.tmisystems.com/products/reference/index.asp)
  2. LSI
  3. Stevens Industries, Inc.
  4. Reynolds & Doyle, Inc.

### 2.2 DEFINITIONS AND MATERIALS:

Listed are definitions and materials commonly used in defining decorative laminate clad casework. Refer to FABRICATION section for those items selected for use on this project.

- A. Definitions: Identification of casework parts by surface visibility.
1. Open Interiors: Any open storage unit without solid door or drawer fronts and units with full glass doors.
  2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts, glass insert doors, sliding solid doors, and/or acrylic doors.
  3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
  4. Other Exposed Surfaces: Faces of doors and drawers when closed, tops of cabinets less than 72" above finished floor.
  5. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72" or more above finished floor.
  6. Concealed Surfaces: Any surface not normally visible after installation.
- B. Core Materials:
1. Particleboard: Medium density 45-50 pound western particleboard of fir or pine meeting or exceeding ANSI A 208.1-1993, M-3 requirements. Thicknesses used are 1/4", 1/2", 3/4", and 1".
  2. Hardboard: Prefinished hardboard in 1/4" thickness meeting or exceeding commercial standards CS-251.
- C. Decorative Laminates/Veneer Where Applicable:
1. High pressure decorative laminate GP28 (.028), NEMA Test LD3 - 1991.

2. High pressure decorative laminate GP50 (.050), NEMA Test LD-3 - 1991.
3. High pressure decorative laminate PF42 (.042), NEMA Test LD-3 - 1991.
4. High Pressure cabinet liner CL20 (.020), NEMA Test LD-3 - 1991.
5. Thermally-fused melamine laminate tested to meet NEMA Test LD-3 - 1991.
6. High pressure backer BK20 (.020).

D. Laminate Color Selection:

1. Basic cabinet body color:
  - a. To include surfaces of all components, including drawer boxes, to be covered with melamine laminate as a minimum requirement; drawer boxes not matching basic color will be rejected.
  - b. Thermally-fused melamine laminate shall be available in manufacturer's standard dove grey, frosty white, or light beige color.
2. Colors for other cabinet surfaces, grade GP28, shall be selected from the current year Wilson Art series. A maximum of one (1) color to be selected per unit face and five (5) colors per project. Minimum of 120 color selections available.
3. Colors for countertop grades, GP50 and PF42, shall be selected from the current year Wilson Art standard solid and pattern offering. A maximum of five (5) colors per project.

E. Edging Materials / Colors:

1. 1mm PVC banding, machine applied with waterproof hot melt adhesive.
2. 3mm PVC banding, machine applied with waterproof hot melt adhesive with external edges and outside corners of door and drawer fronts, and countertops, machine profiled to 1/8" radius for safety.
3. PVC banding shall be available in three (3) colors: dove grey, frosty white, or light beige to match basic cabinet body color selected, or in seven (7) contrasting solid colors: slate grey, black, dawn, wild rose, clear teal, holly berry, and larkspur.
4. Barbed T-edging or laminate self edge on cabinet components will not be acceptable.
5. Glass insert doors in built-in casework shall be glazed with 1/8" D.S.A. glass. In relocatable casework shall be glazed with clear 1/4" thick sheet acrylic, stipple finish.
6. Sliding glass doors shall be clear 1/4" thick sheet acrylic, stipple finish, mounted in aluminum track.
7. Provide extruded rigid PVC of design to hold and trim glass inserts in framed doors. Available in dove grey, frosty white or light beige to match basic cabinet body, or in contrasting slate grey or black color.

## 2.3 SPECIALTY ITEMS:

### A. Metal Parts:

1. Countertop support brackets, under counter support frames, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder painted in dove grey, frosty white or light beige to match basic cabinet body color, or in a contrasting slate grey or black color.

## 2.4 CABINET HARDWARE:

### A. Hinges:

1. Shall be five knuckle, 2-3/4", overlay type, hospital tip, .095" thick steel. Hinges shall have a minimum of eight (8) edge and leaf fastenings. Doors 48 inches and over in height shall have three (3) hinges per door. Available in epoxy finish, color to be dove grey, frosty white or light beige to match basic cabinet body color, or in contrasting black, sienna brown or brushed chrome. Provide magnetic door catch with minimum ten (10) pound pull, attached with screws and slotted for adjustment.

### B. Door and Drawer Front Pulls:

1. Owner to select one of the following:
  - a. Epoxy powder coated metal wire, 96mm spacing on screws. Pull design shall comply with American Disability Act (ADA).
2. Available in dove grey, frosty white or light beige to match basic cabinet body color or in contrasting black or sienna brown.

### C. Drawer Slides:

1. Shall be Blum style No. BS230M with epoxy finish. Slides will have a 100-pound load rating at full extension a built-in, positive stop both directions, with self-closing feature. Slides shall have a lifetime warranty as offered by the slide manufacturer.
2. File drawer slides shall be Blum BS430E full extension. Slides shall have a lifetime warranty as offered by the slide manufacturer.
3. Knee space and pencil drawers shall be equipped with Blum No. 320 for under counter or support frame mounting.

### D. Adjustable Shelf Supports:

1. Shall be injection-molded polycarbonate, clear color to blend with selected interior finish, friction fit into cabinet end panels and vertical dividers, readily adjustable on 32mm (approximately 1-1/4") centers. Each shelf support shall have two (2) integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The supports shall be automatically adaptable to 3/4" or 1" thick shelving and shall provide non-tip feature for shelving. Supports are

designed to readily permit field fixing of shelf if desired. Structural load testing shall show loading to 1,500 pounds (375 pounds per support) without failure.

E. Locks:

1. For doors and drawers as shown on drawings shall be National Lock #M4-7054C, removable core, disc tumbler, cam style lock with strike. Each lock shall be furnished with two (2) keys. Locks for sliding 3/4" doors shall be a disc type plunger lock, sliding door type with strike. Locks for sliding glass/acrylic doors shall be a ratchet type sliding showcase lock.
2. Chain bolts shall be 3" long, shall have a 18" pull and an angle strike to secure inactive door on cabinets over 72" in height. Elbow catches shall be used on inactive doors up to and including 72" in height.

F. Sliding Door Track:

1. For both glass and wood sliding doors shall be anodized aluminum double channel.

G. Pendaflex File Suspension Rails:

1. All file drawers shall include a pair of 14 gauge steel pendaflex file suspension rails, epoxy coated in dove grey, frosty white or light beige to match basic cabinet color. File followers, or other split bottom hardware, shall not be acceptable.

H. Under counter Support Frame:

1. Welded steel countertop support frames shall be provided at all knee spaces where indicated on drawings. Frames shall be available in 3" increments to clear span 24" to 60" width. Frames shall readily accept pencil and knee space drawers, and shall be designed to interface under counter support brackets. Available in dove grey, frosty white or light beige to match basic cabinet body color or in contrasting slate grey or black color.

I. Coat Rods:

1. 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.

2.5 FABRICATION:

A. Fabricate casework to dimensions, profiles, and details shown.

B. Cabinet Body Construction:

1. Tops and bottoms shall be joined to cabinet ends and internal cabinet components such as fixed horizontals, rails and verticals shall be joined using 10mm diameter industrial grade hardwood dowels, laterally fluted

with chamfered ends, securely glued and clamped under pressure during assembly to secure joints and cabinet squareness. Use minimum of six (6) dowels at each joint for 24" deep cabinets and minimum of four (4) dowels at each joint for 12" deep cabinets.

2. Unless specifically indicated, core shall be 3/4" thick particleboard. Edging and surface finishes as indicated herein.
3. Unit backs on fixed cabinetry shall be 1/4" thick prefinished hardboard and on relocatable cabinetry, backs shall be 3/4" thick particleboard structurally doweled into cabinet end and top panels, color matched to cabinet interior. Exposed backs on fixed or movable cabinets to be 3/4" thick particleboard, color matched to cabinet interior, exterior surface GP-28 laminate as selected.
4. All fixed under counter and tall units shall have an integral base created by extending end panels to floor and factory applied blocking between sides. Provide 96mm (nominal 4") high toe base unless otherwise indicated on the drawings.
5. All under counter units except sink base units, shall be provided with full sub-top. Sink base units shall be provided with open top, front welded steel/epoxy painted sink rail full width at top front edge concealed behind face rail/doors, split back removable access panels and bottom panel to have CL-20 high pressure cabinet liner both faces, color to match interior color. No exceptions will be permitted.
6. All end panels and vertical dividers, except sink base units, shall be prepared to receive adjustable shelf hardware at 32mm (approximately 1-1/4") centers. Door hinges, drawer slides and pullout shelves shall mount on line boring to maintain vertical alignment of components and provide for future relocation of doors, drawers, shelves and/or pull-out shelves.
7. All exposed and semi exposed edges of basic cabinet components shall be factory edged with PVC banding, machine applied with waterproof hot melt adhesive.
  - a. Edging shall be 1mm PVC, available in dove grey, frosty white or light beige to match basic cabinet body color.
8. Adjustable shelf core shall be 3/4" thick particleboard up to 30" wide, 1" thick particleboard over 30" wide.
  - a. Front edge shall have factory-applied 1mm PVC, color to match shelf color.
9. Interior Finish, Units with Open Interiors:
  - a. Sides, top, bottom, horizontal and vertical members and adjustable shelving faced with melamine laminate with matching prefinished back. Available in dove grey, frosty white or light beige color
10. Interior Finish, Units with Closed Interiors:

- a. Sides, top, bottom, horizontal and vertical members and adjustable shelving faced with melamine laminate with matching prefinished back. Available in dove grey, frosty white or light beige color.

11. Exposed Ends:

- a. Shall be faced with high-pressure decorative laminate GP-28 (.028) color from casework manufacturer's full range offering of at least 120 colors.

12. Wall Unit Bottom:

- a. Shall be faced with melamine laminate in dove grey, frosty white or light beige to match basic cabinet body color.

13. Wall and Tall Unit Tops:

- a. The top edge of all wall and tall unit end panels shall be factory edged with 1mm PVC to match basic cabinet body color; raw edges at top of wall and tall end panels will not be permitted.
- b. Top surface will be laminated with melamine in dove grey, frosty white or light beige to match basic cabinet body color.

14. Balanced construction of all laminated panels is mandatory. Unfinished core stock, even on concealed surfaces, will not be permitted. No exceptions.

C. Drawers:

- 1. Sides, back and sub front shall be particleboard, 1/2" thick, laminated with melamine in dove grey, frosty white or light beige to match basic cabinet body color. The back and sub front are doweled and glued into the sides. Dowels shall be fluted, with chamfered ends and a minimum diameter of 8mm. Top edge is banded with 1mm PVC edging in a matching color.
- 2. Drawer bottom shall be particleboard, 1/2" thick, laminated with melamine in dove grey, frosty white or light beige to match basic cabinet body color, screwed directly to the bottom edges of the drawer box. Drawer bottom less than 1/2" thick will not be permitted.
- 3. Paper storage drawers are constructed similar except retaining hood shall be included at the rear of each drawer.
- 4. Painted finishes on drawer sides and/or bottom will not be permitted.

D. Door/Drawer Fronts:

- 1. Core for all doors and applied drawer fronts shall be 3/4" thick particleboard. All edges shall be finished as indicated herein.
- 2. Double doors shall be used on all cabinets in excess of 24" wide.
- 3. Exterior faces shall be laminated with high pressure decorative laminate GP-28, color as selected, high pressure cabinet liner CL20 in dove grey,

frosty white or light beige to match basic cabinet body color on inside surface.

4. All edges shall be finished with 3mm PVC available in dove grey, frosty white or light beige to match basic cabinet body color or in contrasting black, sienna brown, dawn, wild rose, clear teal, holly berry or larkspur colors. External edges and outside corners shall be machine profiled to 1/8" radius.

## 2.6 DECORATIVE LAMINATE COUNTERTOPS:

- A. All nominal 1" thick laminate clad countertops shown on drawings shall be constructed with 3/4" particleboard core laminated top face with GP50 1/8" high-pressure decorative laminate, with BK20 backer underside. Provide tight joint fasteners where needed. All exposed edges, including edges of backsplash where used, shall have 3mm PVC banding, machine applied with waterproof hot melt adhesive. Exposed edges and corners shall be machine profiled to 1/8" radius for safety. Edging shall be available in dove grey, frosty white or light beige to match basic cabinet body color or in contrasting black, slate grey, dawn, wild rose, clear teal, holly berry, or larkspur colors.

1. Sinks Stainless Steel – Refer to Plumbing Division 22 Specification.

## PART 3 - EXECUTION

### 3.1 INSPECTION:

- A. The installer must examine the job site and the conditions under which the work under this section is to be performed, and notify the contractor in writing of unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

### 3.2 PREPARATION:

- A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

### 3.3 INSTALLATION:

#### Filler Panels:

- A. Install casework with factory-trained supervision authorized by manufacturer. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit. Provide filler strips, scribe strips and mouldings as indicated or required, and in finish to match cabinet face.
- B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

- C. Attach countertops securely to base units which have been installed level. Spline and glue joints in countertops; provide concealed mechanical clamping of joint. Provide cutouts for fixtures and appliances as indicated; drill pilot holes at corners before making cutouts. Smooth cut edges and coat with waterproof coating or adhesive.

The shimming of countertops to achieve a level installation where base cabinets have not been installed level is not acceptable.

#### 3.4 CLEANING AND PROTECTION:

- A. Repair or remove and replace defective work as directed upon completion of installation.
- B. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.
- C. Advise contractor of procedures and precautions for protection of casework and tops from damage by other trades until acceptance of the work by the Owner. If required cover completed work with 4-mil polyethylene protective enclosure, applied in a manner to allow easy removal without damaging cabinets. Remove cover immediately before time of final acceptance.

END OF SECTION 123216

## SECTION 123616 - METAL COUNTERTOPS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Product Data: For each type of product.

#### 1.2 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal countertops only after all masonry and overhead work has been completed in installation areas.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

#### 1.3 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
- B. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 079200 "Joint Sealants."
  - 1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
  - 2. Joint Sealant: Single component, nonsag, neutral curing, silicone; Class 25.
  - 3. Color: Clear.

#### 2.2 STAINLESS-STEEL COUNTERTOPS

- A. Countertops: Fabricate from 0.062-inch-(1.59-mm-) thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch (25 mm) over the base cabinets.
  - 1. Joints: Fabricate countertops without field-made joints.

2. Weld shop-made joints.
  3. Sound deaden the undersurface with heavy-build mastic coating.
  4. Extend the top down to provide a 1-inch-(25-mm-) thick edge with a 1/2-inch (12.7-mm) return flange.
  5. Form the backsplash coved to and integral with top surface, with a 1/2-inch-(12.7-mm) thick top edge and 1/2-inch (12.7-mm) return flange.
  6. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.
- B. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.
- B. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.
- C. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- D. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

### 3.3 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION 123616

## SECTION 123661 – SOLID SURFACE COUNTERTOPS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Solid-surface-material countertops

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples for Initial Selection: For each type of material exposed to view.

#### 1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

#### 1.5 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

### PART 2 - PRODUCTS

#### 2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS/STOOLS

- A. Configuration: Provide countertops with the following front and backsplash style:
  - 1. Front: As indicated in Drawings, radiused
- B. Countertops: ½” thick, solid surface material with front edge built up with same material.
- C. Fabrication: Fabricate tops in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

#### 2.2 COUNTERTOP/STOOL MATERIALS

- A. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

- B. Adhesives: Adhesives shall not contain urea formaldehyde.
- C. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
  - 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. Avonite Surfaces.
    - b. E. I. du Pont de Nemours and Company.
    - c. Formica Corporation.
    - d. LG Chemical, Ltd.
    - e. Wilsonart LLC.
  - 2. Type: Provide Standard Type unless Special Purpose Type is indicated.
  - 3. Colors and Patterns: As selected by Architect from manufacturer's full range.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

END OF SECTION 123661

## SECTION 131250 - METAL BUILDING SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Structural-steel framing
  - 2. Metal roof panels
  - 3. Metal wall panels
  - 4. Thermal insulation
  - 5. Accessories

#### 1.2 SUBMITTALS

- A. Product Data: For each type of metal building system component.
- B. Shop Drawings: For metal building system components. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Welding certificates.
- F. Metal Building System Certificates: For each type of metal building system, from 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.
    - k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

- G. Material test reports.
- H. Source quality-control reports.
- I. Field quality-control reports.
- J. Maintenance data.
- K. Warranties: Sample of special warranties.

### 1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.
  - 1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
  - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer registered in the Commonwealth of Kentucky.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is approved by the manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.
- E. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- F. Pre-installation Conference: Conduct conference at Project site.

### 1.4 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. Finish Warranty Period: 20 years from date of Substantial Completion.
- B. Special Weather tightness 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 leak or otherwise fail to remain weather tight within specified warranty period.
  - 1. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. A&S Building Systems, Inc.; Division of NCI Building Systems, L.P.
  2. American Buildings Company; Division of Magnatrax Corp.
  3. Butler Manufacturing Company; a BlueScope Steel company.
  4. Nucor Building Systems.
  5. VP Buildings; a United Dominion company.

### 2.2 METAL BUILDING SYSTEM PERFORMANCE

- A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Metal building systems shall be designed according to procedures in MBMA's "Metal Building Systems Manual."
1. Design Loads: As indicated on Drawings.
  2. Design Loads: As required by **MBMA's "Metal Building Systems Manual" and ASCE/SEI 7.10.**
  3. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:
    - a. Purlins and Rafters: Vertical deflection of **1/240** of the span.
    - b. Girts: Horizontal deflection of **1/240** of the span.
    - c. Metal Roof Panels: Vertical deflection of **1/240** of the span.
    - d. Metal Wall Panels: Horizontal deflection of **1/240** of the span.
    - e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
  4. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:
    - a. Lateral Drift: Maximum of **1/200** of the building height.
  5. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.
- C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7.10.**
- D. Wind Performance: Metal building systems shall withstand the effects of wind loads determined according to **ASCE/SEI 7.10**
- E. Thermal Movements: 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 calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): **120 deg F (67 deg C), ambient; 180 deg F (100 deg C)**, material surfaces.
- F. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** of roof area when tested according to ASTM E 1680 at negative test-pressure difference of **1.57 lbf/sq. ft. (75 Pa)**.
- G. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** of wall area when tested according to ASTM E 283 at static-air-pressure difference of **1.57 lbf/sq. ft. (75 Pa)**.
- H. 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. (137 Pa)**.
- I. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a wind-load design pressure of not less than **2.86 lbf/sq. ft. (137 Pa)**.
- J. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for **Class 30**.
- K. Energy Performance: Provide roof panels with Solar Reflectance Index not less than **78** when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.
- L. Energy Performance: Provide roof panels that are listed on the DOE's ENERGY STAR Roof Products Qualified Product List for **low**-slope roof products.
- M. Energy Performance: Provide roof panels with initial solar reflectance not less than **0.70** and emissivity not less than **0.75** when tested according to CRRC.

## 2.3 STRUCTURAL-STEEL FRAMING

- A. Primary Framing: Manufacturer's standard 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; second floor columns; and wind bracing.
  1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly.
  2. Frame Configuration: Single Story w/ Mezzanine – see drawings.
  3. Exterior Column Type: Tapered – See Drawings
  4. Interior Column Type: Straight – See Drawings
  5. Rafter Type: Light-Gauge Steel Z-Purlins
- B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly.
- C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either

cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, pre-painted with coil coating.

- D. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide zinc-plated or hot-dip galvanized bolts for structural-framing components that are galvanized.
- E. Recycled Content of Steel Products: Provide steel products with an average recycled content so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than **25** percent.
- F. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.

## 2.4 METAL ROOF PANELS

- A. **Trapezoidal-Rib**, Standing-Seam Metal Roof Panels Formed with ribs at panel edges and **intermediate stiffening ribs symmetrically spaced** between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
  - 1. Material: **Zinc-coated (galvanized)** steel sheet, **0.028-inch (0.71-mm)** nominal thickness.
    - a. Exterior Finish: **Two-coat 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 **zinc-coated (galvanized) steel** sheet.
  - 3. Joint Type: Panels snapped together.
  - 4. Joint Type: Mechanically seamed, **folded according to manufacturer's standard**.
  - 5. Panel Coverage: **12, 18 or 24 inches**.
  - 6. Panel Height: **minimum of 2 inches (51 mm)**.
  - 7. Uplift Rating: **UL 60**.

## 2.5 METAL WALL PANELS

- A. **Reverse-Rib-Profile**, Exposed-Fastener Metal Wall Panels Formed with raised, trapezoidal major ribs and **intermediate stiffening ribs symmetrically spaced** between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
  - 1. Material: **Zinc-coated (galvanized)** steel sheet, **0.028-inch (0.71-mm)**.
    - a. Exterior Finish: **Two-coat fluoropolymer**
    - b. Color: **As selected by Architect from manufacturer's full range**.
  - 2. Major-Rib Spacing: **12 inches (305 mm) o.c.**
  - 3. Panel Coverage: **36 inches (914 mm)**
  - 4. Panel Height: **1.25 inches (32 mm)**

## 2.6 THERMAL INSULATION

- A. Unfaced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less. Provide density and thickness capable of achieving R-values stated:
  - a. Roof system: R-22 (minimum)
  - b. Wall system: R-13 (minimum)
- B. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E 96/E 96M, Desiccant Method. Color: White

## 2.7 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.
- 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.
- D. Flashing and Trim: Formed from 0.022-inch (0.56-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.
- E. Gutters: Formed from 0.022-inch (0.56-mm) nominal-thickness, 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.
  - 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Formed from 0.022-inch (0.56-mm) nominal-thickness, 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.
- G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

## 2.8 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to evaluate product.
- B. Special Inspector: Owner will engage a qualified special inspector to perform the following tests and inspections and to submit reports. Special inspector will verify that manufacturer maintains detailed fabrication and quality-control procedures and will review the completeness and adequacy of those procedures to perform the Work.
  - 1. Special inspections will not be required if fabrication is performed by manufacturer registered and approved by authorities having jurisdiction to perform such Work without special inspection.
    - a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.
- C. Testing: Test and inspect shop connections for metal buildings according to the following:
  - 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/D1.1M 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.
- D. Product will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

## 2.9 FABRICATION

- 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" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to 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.

- D. Secondary Framing: Shop fabricate framing components to 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.
- E. 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.

## PART 3 - EXECUTION

### 3.1 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, 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 level, plumb, rigid, secure, and true to line. 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 A325 or A490 Bolts" for bolt type and joint type specified.
    - a. Joint Type: Snug tightened or pre-tensioned.

- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
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. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Steel Joists: Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.
1. Space, adjust, and align joists accurately in location before permanently fastening.
  2. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
  3. Bolt joists to supporting steel framework using carbon-steel bolts unless high-strength structural bolts are required by the manufacturer.
  4. Comply with RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for high-strength structural bolt installation and tightening requirements.
  5. 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 where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
  2. Wind/seismic forces are to be resisted by portal frames (no diagonal bracing) in end walls and side walls.
- 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 erection tolerances of structural framing within AISC 303.

### 3.2 METAL PANEL INSTALLATION, GENERAL

- A. 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.
  6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- B. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, 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 weather-tight enclosure. Avoid "panel creep" or application not true to line.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- D. 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 recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant the 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."

### 3.3 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. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
1. Install clips to supports with self-drilling or 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 that 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 peaks, rake edges, eaves and each side of ridge caps.
- C. 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 sealing 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-drilling 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.

### 3.4 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. Pre-drill 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-drilling or self-tapping screws.
  11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

### 3.5 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
1. Install blankets straight and true in one-piece lengths.
- B. Blanket Roof Insulation: Comply with the following installation method:
1. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. 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.

- a. Thermal Spacer Blocks: Where metal roof panels attach directly to secondary framing, install thermal spacer blocks.
  2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
- C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. 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.

### 3.6 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weather tight 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 contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant 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 as required for gutter size, but not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion as indicated in drawings.

- 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 (1524 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. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

### 3.7 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. 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 A325 or A490 Bolts."
  - 2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M 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.
- D. Product will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 13125