

SECTION 07 41 13.06

STANDING SEAM METAL ROOF AND SOFFIT PANELS

SPECS

MVUSD ROOFING PROJECT - COLE CANYON

BID NO. 04052021

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

- A. Section Includes:

- 1. Architectural standing-seam metal roof panels.
- 2. Metal roof accessories.
- 3. Underlayment for metal roofing.
- 4. Barrier Board

- B. Related Sections:

- 1. Division 06 rough carpentry section for wood nailers, curbs, and blocking.
- 2. Division 07 Section "Roof Specialties" for manufactured fasciae, copings, roof drainage systems, and other roof specialties not part of metal roof panel assemblies.
- 3. Division 07 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

- C. Alternates: Refer to Division 01 Section "Alternates" for description of Work in this Section affected by alternates. No alternate roof systems are authorized.

1.3 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's representative, substrate Installer, and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.
 - 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 roof panel installation, including manufacturer's written instructions.
 - 4. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 5. Review structural loading limitations of substrate during and after roofing.
 - 6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - 7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
 - 8. Review temporary protection requirements for metal roof panel assembly during and after installation.
 - 9. Review roof observation and repair procedures after metal roof panel installation.
 - 10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

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

- B. Shop Drawings:
1. Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and end lap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details specific to project, signed and sealed by the qualified professional engineer responsible for their preparation. Distinguish between factory- and field-assembled work.
 2. Shop Drawings shall be developed by Manufacturer and Stamped by a Licensed Engineer in the State of California. Shop Drawings shall include fastener size and gauge needed to meet or exceed loads.
- C. Accessory Details: Include details of the following items:
1. Flashing and trim.
 2. Pipe penetration flashings.
 3. Roof curbs.
 4. Gutters.
 5. Downspouts.
- D. Delegated-Design Submittal: For metal roof manufacturers other than the BOD, provided panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the metal roof panel manufacturer's qualified professional engineer responsible for their preparation. Include the following:
1. Structural analysis data indicating compliance with Performance Requirements Article.
 2. UL Listing(s).
- E. Samples for Verification for other than the Basis Of Design: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Metal Roof Panels: 12 inches (300 mm) long by actual panel width. Include fasteners, clips, closures, and other metal roof panel accessories.
 2. Metal Wall Panels: 12 inches (300 mm) long by actual panel width. Include fasteners, clips, closures, and other metal roof panel accessories.
 3. Accessories: 12-inch- (300-mm-) long Samples for each type of accessory.
 4. Underlayment: 12 inch by 12 inch piece of underlayment.
 5. Letter signed by Licensed Engineer stipulating that the materials will comply with all prerequisites and requirements stipulated or implied by this section.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: (for other than the Basis of Design) For manufacturer, Installer, professional engineer, and manufacturer's technical representative.
 - 1. Submit Installer qualifications in the form of an original letter on manufacturer's letterhead signed by authorized manufacturer representative.
 - 2. Provide list of 5 other locations within 20 mile radius that shows the system with all features and capabilities.
- B. Product Test Reports for other than the Basis of Design: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product. Indicate compliance with requirements in Performance Requirements Article:
 - 1. Air Infiltration.
 - 2. Water Penetration.
 - 3. Hydrostatic-Head Resistance.
 - 4. Wind-Uplift Resistance.
 - 5. Solar Reflectance.
 - 6. Minimum Emissivity Rating.
- C. Field Quality Control Reports.
- D. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal roof and wall panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer of plant-fabricated metal roof panel systems listed in this Section and meeting performance requirements, with a minimum of five years' experience providing metal roof panel systems for projects of similar type and scope, offering engineering, warranty, technical inspection, and maintenance inspection services specified.
- B. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience

installing similar work, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to furnish warranty of type specified.

- C. Professional Engineer Qualification: A qualified professional engineer licensed in the project state and experienced in metal roof panel system design, similar to that required for Project.
- D. Manufacturer's Technical Representative Qualifications: For other than the BOD, an authorized full-time employee representative of manufacturer, certified as a Registered Roof Observer by the Roof Consultants Institute, and experienced in the installation and maintenance of the specified roof panel system and qualified to determine Installer's compliance with the requirements of this Project.
- E. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing and inspection indicated may be utilized by the Owner.
 - 1. Inspection personnel shall be certified as a Registered Roof Observer by the Roof Consultants Institute and shall be experienced in the installation and maintenance of the specified roofing system and qualified to determine Installer's compliance with the requirements of this Project.
- F. Source Limitations: Obtain metal roof panels and accessories from a single source supplied or approved by metal roof panel manufacturer.
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including fascia and gable trim, as shown on Drawings; approximately four panels wide by full eave width, including, underlayment, 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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.
- E. Protect materials to be installed under the roof system as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment to the extent allowable by Manufacturer.
 - 2. Protect against ignition at all times.
 - 3. Complete installation and concealment of underlayment materials as rapidly as possible in each area of construction.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.11 COORDINATION

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

1.12 WARRANTY

- A. Manufacturers Warranty shall be issued by the same Manufacturer as the Built-Up Roofing, Built Up Roofing Restoration and the Air Barrier systems. This is to assure sole source responsibility and compatibility of the systems and integral material components.
- B. Warranty, General: Warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers

and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

- C. Roof System Warranty, General: Warranties specified in this Section include the following components and systems specified in other sections supplied by the metal roof and panel manufacturer:
1. Manufactured copings, roof edge, counter-flashings, and reglets.
 2. Roof curbs, hatches, and penetration flashings.
 3. Roof expansion joint assemblies.
 4. Penetration flashings.
- D. Special System Weathertightness Warranty for Metal Roof and Wall Panels: Written warranty in which Manufacturer agrees to repair or replace metal roof and Wall panel assemblies that fail to remain weathertight, including leaks, within specified warranty period. Warranty to be issued by same Manufacturer as the Low Slope Roofing for sole source responsibility.
1. Warranty Period: 20 years from date of Substantial Completion.
 2. Limit of Warranty Coverage: Not to exceed original installed cost of metal roof panel assembly including labor and materials.
 3. Qualified Installer Requirement: Installer must meet requirements in Quality Assurance Article.
 4. Installation Inspection Requirement: By manufacturer's technical representative in accordance with requirements of Part 3 Field Quality Control Article.
 5. Annual Manufacturer Inspection Requirement: By qualified manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's annual inspections is included in the Contract Sum. Inspections to occur in Years 2, 5, 10, and 15 following Substantial Completion.
- E. Special Warranty on Panel Finishes: Written warranty in which Manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes under normal atmospheric conditions 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 MANUFACTURERS

- A. Basis of Design Manufacturers/Products: Subject to compliance with requirements, provide products by the following manufacturers comparable to the Basis of Design product specified:
 - 1. Tremco, Inc., Beachwood, OH, (800) 562-2728, www.tremcoroofing.com.
 - 2. Shark Skin, California
 - 3. Substitutions of system: None allowed.
- B. Available Manufacturers/Products: 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. Tremco, Inc., Beachwood, OH, (800) 562-2728, www.tremcoroofing.com.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Energy Performance: Provide roof panels that are listed on the U.S. Department of Energy's ENERGY STAR Roof Products Qualified Product List for steep-slope roof products.

- D. 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 ANSI/CRR-1.
- E. Structural Performance: Provide metal roof panel assemblies withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.
- G. Hail Resistance: Provide metal roof panel assemblies listed with UL as Class 4 hail resistant panels.
- H. Air Infiltration: Air leakage through assembly of not more than the following when tested according to ASTM E 1680, based upon 16 inch (406 mm) wide panel:
 - 1. Maximum 0.0001 cfm/sq. ft. (0.001 L/s x sq. m) of roof area at test-pressure difference of -1.57 lbf/sq. ft. (-75.2 Pa).
 - 2. Maximum 0.0028 cfm/sq. ft. (.014 L/s x sq. m) of roof area at test-pressure difference of -20.00 lbf/sq. ft. (-958 Pa).
- I. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 20.00 lbf/sq. ft. (958 Pa).
- J. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. 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.

2.3 ARCHITECTURAL STANDING-SEAM METAL 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 the side laps.

Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Roofing Panels: Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Factory-formed symmetrical panels with vertical pencil ribs in panel. at flat pan between ribs; designed for sequential installation in either direction by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and mechanically seaming panels together utilizing a seam cap, and configured to enable future replacement of individual panels without disturbing adjacent panels.
1. Basis-of-Design Product: Tremco, Inc., TremLock T-238.
 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 50 (Class AZM150 coating designation, Grade 340), prepainted by the coil-coating process to comply with ASTM A 755/A 755M(); structural quality.
 - a. Thickness: 0.028-inch/24 ga. (0.71-mm) minimum thickness.
 - b. Surface: Smooth, flat finish.
 - c. Exposed Coil-Coated Finish: 2-Coat Fluoropolymer.
 - d. Exposed Finish: Exposed metallic coating.
 - e. Color: Patina Green as selected by Architect from manufacturer's standard colors.
 3. Clips: Low-movement floating clips to accommodate thermal movement; fixed clips where design permits; intermittent or continuous clips as required to meet performance requirements; and with clip bearing plate where required.
 - a. Material: 0.064-inch- (1.63-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 4. Joint Type: Field mechanically seamed.
 5. Seam Cap: Match panel material and finish; provide with two rows of integral factory hot-applied sealant.
 6. Panel Pan Configuration: Stiffener Ribbed.
 7. Panel Seam Height: Not less than 1-3/8 inch (34.9 mm).
 8. Panel Coverage: 16 inches (406 mm).
 9. Panels shall be curved at the job site to match the actual conditions.

- C. **Soffit Panels:** low profile panel with pencil ribs. Factory formed symmetrical panels with continuous symmetrical seams. Fasteners symmetrically positioned for uniform alignment vertically and horizontally across field area and trim.
1. Panel Width: 24"
 2. Mid Panel rib: at 12"
 3. Thickness of overall panel with seams: 0.5"
 4. Gauge: 24 gauge
 5. Basis Of Design: 5V-Crimp and by Same Manufacturer of Roof Panel.

D. Panel Finish:

1. Panel finish shall be "Flurothane Coastal" coating using a premium fluoropolymer (PVDV) system having an extra thick film primer.
2. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
3. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
4. 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.
5. Properties Steel Panels and Accessories:

Speculare Gloss	Typical: 5-35; a 5-15 gloss at 85° is also available
Pencil Hardness	HB to 2H
Humidity Resistance 100% RH, 2,000 hrs ASTM B117	no field blisters
Salt Spray Resistance 2,000 Hours ASTM B 117	HDG or Galvalume®: creep from scribe no more than 1/16" (2mm), no field blisters
Flame Test ASTM E 84	Class A coating
Water Immersion 500° hours 100 F ASTM D 870	No loss of adhesion
Dew Cycle Weatherometer 1,000 hours ASTM D 3361	Color: No more than 5rE Hunter units Chalk: Rating no less than 8
Abrasion Resistance ASTM D 968	100 ± 10 liters

2.4 METAL ROOF ACCESSORIES

- A. Metal Roof Accessories, General: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers,

closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at top and bottom and corners, fabricated of same metal as metal roof panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- B. Panel Sealants: Provide one of the following identical to that used in test panels meeting performance requirements:
1. Sealant Tape: Pressure-sensitive, 99 percent solids, gray polyisobutylene or butyl rubber compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1 inch (25 mm) wide and 1/8 inch (3 mm) thick, with nylon spacer beads to prevent over compression of the sealant tape.
 2. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311, with nylon spacer beads to prevent over compression of the sealant tape.
- C. Flashing and Trim: Formed from same material as roof panels, pre-painted with coil coating, minimum 0.028 inch (0.71 mm) thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.
- D. Pipe Penetration Flashings: Flexible boot type, with stainless steel compression ring, and stainless- steel pipe strap. Use silicone-type boot at hot pipes.
- E. Gutters: (where applicable) Formed from same material roof panels. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (900 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.
- F. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.
- G. Pipe Penetration Flashing: Premolded EPDM pipe collar with flexible aluminum ring bonded to base and stainless- steel pipe clamp to secure collar to pipe.

2.5 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils (0.76 to 1.0 mm) thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or

SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
 3. Underlayment:
 - a. Hydra Shield by McElroy
 - b. VersaShield UL Fire Barrier by GAF
 - c. Ultra SA by Sharkskin
- B. Slip Sheet: Manufacturer's when recommended system manufacturer, of type required for application.

2.6 FASTENERS

- A. Fasteners:
1. Fasteners shall be minimum 15 gauge or as indicated in Engineered Shop Drawings.
 2. Shall be long enough to pass through the structural deck and extend a minimum of 1 1/2" beyond the bottom of the deck.
- B. Fasteners for clips shall be pan head.
- C. Any exposed fasteners shall be color coated to match the adjacent color.
- D. Fasteners shall be self-tapping with a head diameter of 0.435" and a shank diameter of 0.170" diameter.
- E. Fasteners shall have a corrosive resistance of <15% red rust after 25 Kesternich cycles
- F. Pullout strength:
1. 3/4" in plywood: 525 lbf
 2. 22 gauge steel: 450 lbf

2.7 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.
- C. Base or Sill Channels: 0.079-inch (2.01-mm) nominal thickness.

- D. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), and depth required to fit insulation thickness indicated.
 - 1. Nominal Thickness: As indicated.
- E. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.8 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.9 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. 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 side laps with standard factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.
- E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the 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. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
3. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.10 Barrier Board

- A. Barrier board shall consist of ¼" thick dens deck by same manufacturer as the roofing panels.
- B. Panels may be shipped in largest size available.
- C. Panels shall be pre-primed.
- D. Installation material: Low Rise Insulation adhesive by Roofing Manufacturer.

2.11 FINISHES

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
 - 1. Examine solid roof substrate to verify that substrate joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - 2. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
 - 3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Confirm with owner for space to locate “on-site” rolling machine needed to create radius in panels prior to installation.
- B. Provide safety barriers as needed to prevent accidental damage to materials.
- C. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

3.3 BARRIER BOARD

- A. Install barrier board with long side perpendicular to slope. Secure to deck with screws and plates. Stagger joints.
- B. Stagger joints from panels below.
- C. Use one fastener for every two square feet. Two fasteners minimum.

3.4 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
 - 1. Apply over entire roof surface
 - 2. Extend 6 inches up vertical surfaces adjacent to the metal roof system.
- B. Install flashings to cover underlayment to comply with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim."

3.5 METAL ROOF PANEL INSTALLATION, GENERAL

- A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
- B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Pre-drill panels for fasteners.
 - 1. Point of Fixity: Fasten each panel along a single line of fixing located at eave.
 - 2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.
- C. Install metal roof panels as follows:
 - 1. Commence metal roof panel installation and install minimum of 300 sq. ft. (27.8 sq. m.) in presence of factory-authorized representative.
 - 2. Field cutting of metal panels by torch or abrasive saw is not permitted.
 - 3. Install panels perpendicular to supporting purlins. And parallel to roof slope.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Provide metal closures at rake edges, rake walls, and each side of ridge and hip caps.
 - 6. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
 - 7. Install ridge and hip caps as metal roof panel work proceeds.

8. Install metal flashing to allow moisture to run over and off metal roof panels.
- D. Fasteners:
1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.
 2. Fasteners shall be color coated to match panel when exposed.
- E. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
1. Use slip sheet where roof panels will contact wood, ferrous metal, or cementitious construction.
- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.6 METAL ROOF PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure/bearing plates at locations indicated in manufacturer's written installation instructions.
 3. Erection Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet (1:960) on slope and location lines as indicated and within 1/8-inch (3 mm) offset of splices and alignment of matching profiles.

4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

3.7 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements and manufacturer's written installation instructions. 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. Form trim and transition joints using compressed joints with captive butyl sealant capable of resisting static water pressure. Cleated joints and exposed joint sealants do not meet this requirement.
 2. Use 24 gauge metal to match panel. Use 22 gauge where indicated.
 3. 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.
 4. 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 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 sealed or lapped, riveted, and sealed joints. Attach gutters to eave with gutter hangers spaced 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.
- D. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.

1. Primary downspout shall be black iron pipe and painted to match adjacent surface(s).
 - a. Pipe ID shall be 1" larger than the Kynar downspout leader coming from gutter.
 - 1) Secure pipe to structural elements built into the wall. Seal fasteners with butyl sealants.
 - b. Provide elbows at base of downspouts to direct water away from building.
 2. Connect downspouts to underground drainage system where indicated.
- E. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- F. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage, at their option, a qualified independent testing and inspecting agency to perform substrate examination, interim observations, and final roof inspections, and to prepare reports.
- B. Testing Agency: Contractor shall engage a qualified independent testing and inspecting agency acceptable to Owner for a minimum of 7 full-time days on site to perform substrate examination, interim observations, and final roof inspections, and to prepare reports.
- C. Manufacturer's Technical Representative: Engage a qualified manufacturer's technical representative acceptable to Owner for a minimum of 7 full-time days on site to perform substrate examination, interim observations, and final roof inspections, and to prepare reports.
- D. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- E. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.06