

SECTION 074113

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:
 - A. Factory-formed and field-assembled, metal roof panels.
 - B. Metal Gutters and Downspouts.
 - C. Snow Guards.
- B. Related Sections include the following:
 - A. Division 7 Section "Sheet Metal Flashing and Trim" for fascia, copings, flashings and other sheet metal work not part of metal roof panel assemblies.
 - B. Division 7 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

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.
- B. Steel Sheet Thickness: Minimum thickness of base metal without metallic coatings or painted finishes.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide metal roof panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.
- B. Water Penetration: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
 - A. Test-Pressure Difference: 2.86 lbf/sq. ft.
 - B. Test-Pressure Difference: 20 percent of positive design wind pressure, but not less than 6.24 lbf/sq. ft. and not more than 12.0 lbf/sq. ft..
 - C. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
 - D. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.

- C. Water Absorption: Maximum 1.0 percent absorption rate by volume when tested according to ASTM C 209.
- D. Thermal Movements: Provide metal roof panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - A. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal roof panel and accessory.
 - A. 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.
- B. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.
 - A. Include similar Samples of trim and accessories involving color selection.
- C. Maintenance Data: For metal roof panels to include in maintenance manuals.
- D. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
 - A. Installer's responsibilities include fabricating and installing metal roof panel assemblies and providing professional engineering services needed to assume engineering responsibility.
 - B. Engineering Responsibility: Preparation of data for metal roof panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each type of metal roof panels through one source from a single manufacturer.

1.7 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.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of roof framing and roof opening dimensions by field measurements before metal roof panel fabrication and indicate measurements on Shop Drawings.
 - A. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal roof panels without field measurements, or allow for field-trimming of panels. Coordinate roof construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.9 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal roof panel assemblies that fail in materials or workmanship within specified warranty period.
 - A. Failures include, but are not limited to, the following:
 - a. Structural failures, including rupturing, cracking, or puncturing.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - B. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - A. 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.
 - B. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be field assembled with concealed fastener system. Include all accessories necessary to provide a complete weathertight system.
 - A. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports. Fastened in a manner to allow thermal movement.
 - A. Manufacturers:
 - a. Everlast Roofing, Inc.
 - b. "Or Approved Equal"
 - B. Panel Profile: Everlast II
 - C. Material: Zinc-coated (galvanized) steel sheet, 0.0159 inch thick.
 - a. Exterior Finish: Fluoropolymer or Kynar.
 - b. Color: As selected by Government Design Professional from manufacturer's full range.
 - D. Surface: Smooth.
 - a. Material: 26-27 gauge, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 - E. Panel Coverage: 36"
 - F. Raised Panel Height: $\frac{3}{4}$ "
 - G. Uplift Rating: UL 90.

2.3 PANEL SEALANTS

- A. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2-inch-wide and 1/8 inch thick.
- B. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
- C. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering, Polyethylene-Faced Sheet: ASTM D 1970, 40 mils thick minimum, consisting of slip-resisting polyethylene-film reinforcing and top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied.

- A. Products:
 - a. Carlisle Coatings & Waterproofing, Div. of Carlisle Companies Inc.; Dri-Start "A."
 - b. Owens Corning; WeatherLock.
 - c. Polyguard Products, Inc.; Polyguard Deck Guard.
 - d. "Or Approved Equal"

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating.
 - A. Fasteners for Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.
 - B. Fasteners for Roof Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal roof panels.
 - C. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 - D. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 ACCESSORIES

- A. Roof Panel Accessories: Provide components 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.
 - A. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
 - B. Clips: Minimum 0.0625-inch- thick, stainless-steel panel clips designed to withstand negative-load requirements.
 - C. Cleats: Mechanically seamed cleats formed from minimum 0.0250-inch- thick, stainless-steel or nylon-coated aluminum sheet.
 - D. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - E. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Gutters: Formed from 0.0179-inch- thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, sized according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced 36 inches o.c., fabricated from same metal as gutters. Provide bronze, copper, or aluminum wire ball strainers at outlets. Finish gutters to match roof fascia and rake trim.

- C. Downspouts: Formed from 0.0179-inch- thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; complete with formed elbows and offsets. Finish downspouts to match metal roof panels.
- D. Snow Guards: Prefabricated, non-corrosive units.
 - A. Manufacturers:
 - a. ST Fastening Systems.
 - b. Snow Defender.
 - c. "Or Approved Equal."
 - B. Material: Extruded Aluminum or Stainless Steel.
 - a. Finish: Powder Coat.
 - 1) Color: As selected by Government Design Professional from manufacturer's full range.

2.7 FABRICATION

- A. General: Fabricate and finish metal roof 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.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Where indicated, fabricate metal roof panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.
- D. 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.
 - A. 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. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - C. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 - E. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal roof panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal roof panel manufacturer for application but not less than thickness of metal being secured.

2.8 FINISHES, GENERAL

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of work.
 - A. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 - B. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. 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.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."
- C. Install fascia and copings to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

3.3 METAL ROOF PANEL INSTALLATION, GENERAL

- A. General: Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - A. Field cutting of metal roof panels by torch is not permitted.
 - B. Install panels perpendicular to purlins.

- C. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels.
 - D. Provide metal closures at peaks, rake edges rake walls and each side of ridge and hip caps.
 - E. Flash and seal metal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 - F. Locate and space fastenings in uniform vertical and horizontal alignment.
 - G. Install ridge and hip caps as metal roof panel work proceeds.
 - H. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - I. Lap metal flashing over metal roof panels to allow moisture to run over and off the material.
- B. Metal Roof Panels: Fasten panels to supports with fasteners following manufacturer's recommended locations.
- C. Flash and seal panels with weather closures where soffit panels meet walls and at perimeter of all openings.
- D. Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- E. Fasteners:
- A. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.
 - B. Aluminum Roof Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized steel fasteners for surfaces exposed to the interior.
- 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.
- A. Coat back side of stainless-steel roof panels with bituminous coating 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.
- A. 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.
 - B. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.4 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under metal roof panels. Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply over entire roof, in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

- B. Install flashings to cover underlayment to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."
- C. Apply slip sheet over underlayment before installing metal roof panels.

3.5 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.
 - A. 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, 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.
 - A. 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.
 - B. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. 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 deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 - A. Provide elbows at base of downspouts to direct water away from building.
 - B. Tie downspouts to underground drainage system indicated.
- E. Snow Guards: Attach snow guards per manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

- 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 07411