

SECTION 07 41 13

METAL ROOF PANELS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Section Includes, but is not limited to:
 - 1. Preformed metal roof panels, flashing required to weatherproof the system (ridge, hip, valley, cleat, eave, rake wall, rake edge, apron, inside corner, outside corner, gutter, downspout, drip sill, end wall, underlayment and other miscellaneous flashing), related accessories necessary for attachment of the roofing system, all butyl tape and sealant used in conjunction with the roofing system, and necessary attachment hardware as required to meet the performance standards and complete the roofing enclosure.

1.02 REFERENCES:

- A. American Iron and Steel Institute (AISI), Specification for the Design of Cold-Formed Steel Structural Members (August 1996).
- B. American Institute of Steel Construction (AISC) Manual of Steel Construction (Current Edition).
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A792: Specification for Sheet Steel, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 2. ASTM E283-91: Test Method for Rate of Air Leakage over Solid Substrate.
 - 3. ASTM E331-93: Test Method for Rate of Water Penetration over Solid Substrate.
 - 4. ASTM E1680-95: Test Method for Rate of Air Leakage over Open Framed Structure.
 - 5. ASTM E1646-95: Test Method for Rate of Water Penetration over Open Framed Structure.
 - 6. ASTM E1592-95: Standard Test Method for Structural Performance of Sheet Metal and Siding Systems by Uniform Static Air Pressure Difference.
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - 1. Architectural Sheet Metal Manual (latest edition).
- E. Underwriter's Laboratory (UL) Roofing Materials and Systems Directory:
 - 1. Roofing Materials and Systems Directory (1997 edition) listings and classifications of Underwriter's Laboratory roofing construction assemblies.

1.03 SUBMITTALS

- A. Shop Drawings Submittals:
 - 1. Manufacturer of the metal roof system shall provide complete shop drawings.
 - 2. Shop drawings must be submitted and returned as acceptable prior to the beginning of product production.
- B. Product Data Submittals:
 - 1. Submit manufacturer's detailed product literature including the system profile sheet, system description including: material base-sheet gauge, seam height, panel on-center, finish, and sealant as required.
 - 2. Submit manufacturer's installation guidelines of the specified product.
 - 3. Submit a sample of each type of roof panel, complete with factory finish. In the case where custom color is specified, send a custom color chip for written approval along with a standard color product sample for review.

1.04 QUALITY ASSURANCE:

- A. Qualification of installers:
 - 1. Competent and skilled sheet metal applicators familiar with manufacturer's products, standard details and recommendations. Applicator shall have at least two (2) years experience applying these types of materials with successful completion of projects with similar scope.
 - 2. Installers shall be thoroughly trained and experienced in the necessary crafts and who are completely familiar with and comply to the recommendations and details of the manufacturer and the "Architectural Sheet Metal Manual" published by SMACNA.
 - 3. Installers shall follow the manufacturers' installation details without exception unless written authorization from the manufacturer and architect are provided on an installation detail revision. Detail revision authorization must be made in advance of product installation.
- B. Qualification of the product manufacturer:
 - 1. Manufacturer shall be a company specializing in Architectural Sheet Metal Products with at least ten (10) years experience. Being listed as a prequalified manufacturer does not release manufacturer from providing complete, current and acceptable test data for each performance, thermal, and wind load requirement specified for specific profile proposed.
 - 2. Manufacturer shall operate a permanent, full-time, manufacturing facility where the metal roof panels are produced on fixed based roll-forming machines that are included in the Underwriter's Laboratory field inspection services. These facilities must be currently under inspection at least four times per year by Underwriter's Laboratory personnel to verify compliance that the products fabricated are in accordance with the specifications of the products, which were originally tested.
- C. Wind uplift: Finished application shall be accordance with the standards of Factory Mutual (FM) 1-90 (roof system shall withstand 90 lbs psf of wind uplift tested pressure).

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver roof system components to project site in manufacturer's unopened original containers.
- B. Protect roof system components during shipment, storage, handling and erection from mechanical abuse, stains, discoloration and corrosion.
- C. Provide strippable plastic film on all painted surfaces between contact areas to prevent abrasion during shipping, storage and handling.
- D. Store materials off the ground, providing for drainage, under protective cover which allows for air circulation and protection from foreign material contamination, mechanical damage, cement, lime, or other corrosive materials.
- E. Handle materials to prevent damage to surfaces, edges and ends of roofing components. Damaged material shall be rejected and removed from site.
- F. Examine materials upon delivery to jobsite. Reject and remove physically damaged, stained or marred material from project site.
- G. Metal roof components with strippable film must not be stored with exposure to direct sunlight.
- H. Stack material to prevent damage and allow for adequate ventilation and drainage.

1.06 SITE CONDITIONS

- A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for preformed metal roofing system.
- B. Protection:
 - 1. Provide protection or avoid traffic on completed roof surfaces.
 - 2. Do not overload roof with stored materials.
 - 3. Support no roof-mounted equipment directly on roofing system.
- C. Determine that work of other trades which penetrates roof or is to be made watertight by roof is coordinated by location, in place, and accepted prior to installation of roofing system.

1.07 WARRANTIES

- A. Furnish manufacturer's Standard Twenty (20) Year Warranty stating the architectural fluorocarbon coating will:
 - 1. Not crack, chip, peel or exhibit any other mechanical failure of paint to adhere to the substrate.
 - 2. Not exhibit fading or color change in excess of five (5) hunter delta E units as determined by ASTM D2244-79.
 - 3. Not chalk in excess of a numerical rating of eight (8) as determined by ASTM D4214-89
- B. Furnish manufacturer's Standard Watertightness Warranty for a period of twenty (20) years after the date of substantial completion. Entire source of material and labor shall be the sole responsibility of one subcontractor.

PART 2 - PRODUCT

2.01 METAL ROOF PANELS

- A. Manufacturer:
 - 1. Dimensional Metals, Inc.
 - 2. Or an approved equal.
- B. Metal roof panels:
 - 1. Model Inter-Lock IL2016
 - 2. Seam Height: 1 3/4"; Seam On-center: 16"
 - 3. Standing seams shall incorporate a continuous interlocking connection with concealed anchor clips that prevents the entrance of water passage.

2.02 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Continuous, one-piece, preformed, prefinished single length roof panels.
 - 2. Panels, clips, and other components required for specific project conditions.
 - 3. Manufacturer is responsible for providing evidence acceptable to Architect that manufacturer's specified roof system is capable of meeting thermal, wind uplift, and performance requirements specified.
- B. Thermal Movement:
 - 1. Complete metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.

2. Interface between panel and expansion clip shall provide for applicable thermal movement in each direction along longitudinal direction.
- C. Performance Requirements:
 1. Underwriter's Laboratories, Inc. (UL) Wind Uplift Resistance Classification for Roof Assembly shall be Class 90, as installed, pursuant to Construction Number (selected from available assemblies in technical section of architectural binder) 431, 431A, 432, 433, 498, 498A, or 498B as defined by UL 580. Certified statements from manufacturer without proper UL classification will not be acceptable.
 2. Complete metal roof system shall have maximum static pressure air infiltration of 0.046 cfm / square foot with 1.57 psf air pressure differential when tested in accordance with ASTM E283-91 or 0.014 cfm / square foot with 1.57 psf air pressure differential when tested in accordance with ASTM E1680-95.
 3. Complete metal roof system shall have no uncontrolled water penetration (dynamic water pressure), other than condensation, when exposed to dynamic rain at 6.24 psf differential static pressure when tested for not less than fifteen (15) minutes in duration in accordance with ASTM E331-93 or ASTM E1646-95.
 4. Entire roofing system (metal panels, flashing, expansion joints, and penetrations), are to be detailed to provide watertight roof under peak weather conditions.

2.03 SHEET MATERIALS

- A. Unfinished base sheet material shall be 24 Gauge (.024") Galvalume Plus Clear Acrylic Coated Aluminum-Zinc Alloy Coated Steel meeting ASTM A792.
- B. Prefinished base sheet material shall be 24 Gauge (.024") Galvalume Aluminum-Zinc Alloy Coated Steel Grade C meeting ASTM A792.
- C. Finish shall be 70% Kynar 500 or Hylar 5000 Fluorocarbon coating, applied on a continuous coil coating line, with top side dry film thickness of 1.1 +/- .01 mil dry film thickness and on the reverse side a wash coat and primer of .04 +/- .01 mil total dry film thickness.
- D. Finish color shall be selected by the Architect from the manufacturer's current standard color selection guide. Unless otherwise noted all products shall be of the same finish and color.
- E. Strippable film shall be applied to the topside of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film must be removed during installation.

2.04 PREFORMED METAL ROOFING SYSTEM

- A. Standing seams shall contain factory injected butyl sealant that runs continuously throughout the panel length as job conditions dictate.
- B. Panel clips shall be as recommended by the manufacturer to meet the performance criteria of this specification.
- C. All exposed adjacent flashing shall be of the same material and finish as the roof panels.
- D. Fasteners:
 1. Exposed screw fasteners shall be 300 series alloy stainless steel with integrally bonded neoprene washers or Zinc Aluminum Cast head covers with integral neoprene gaskets.
 2. Exposed pop rivets shall be stainless steel, rivet and mandrel, self plugging type #44 - 1/8" diameter 1/4" grip range minimum. Exposed pop rivets shall be painted to match the metal roof system.
 3. Concealed fasteners for anchor clips shall be #10 -12 - pancake head #2 Phillips drive screw as required to meet the performance criteria in this specification. Length of

- fastener shall such to accommodate the depth of the roof deck insulation and penetrate the metal deck to a maximum length of 1".
4. Concealed fasteners for flashing attachment shall be #8 -15 - 1-1/4" long truss head #2 Phillips drive screw as required to meet the performance criteria in this specification.
 5. There shall be no exposed fasteners except to fasten flashing, at fixing points, or as indicated on the shop drawings.
- E. Closures:
1. Hip and ridge closures shall be factory fabricated from similar material to the roof panels. Hip and ridge closures shall be field cut to fit properly between the panel seams.
- F. Sealant:
1. Factory-applied seam sealant shall be non-curing butyl designed for metal to metal connection in concealed joints, if specified.
 2. Field applied sealant and/or butyl tape shall be as recommended by the manufacturer of the metal roof system.
- G. Expansion joint: Form in accordance with the manufacturer's instructions and similar to Product Detail SL25 08-00.
1. Building expansion required:
 - a. Width: 2"
 - b. Provide both at roof to roof areas and at roof to wall.

2.05 FABRICATION

- A. Panels shall be fabricated in permanent fabrication facilities in continuous lengths as required. No horizontal end lap joints will be accepted, unless panels exceed 65' in length or jobsite conditions dictate. Site formed panels or portable roll formers will not be accepted.
- B. Panel design shall incorporate concealed clips and fasteners. Exposed fasteners in roofing panels will not be accepted.
- C. Standing seam design shall prevent water infiltration by utilizing a capillary break to prevent siphoning.
- D. Fabricate roofing and related sheet metal work in accordance with approved shop drawings and applicable standards set forth in the Sheet Metal and Air Conditioning Contractors National Association - Architectural Sheet Metal Manual (1987 edition).
- E. All roofing and sheet metal flashing shall be fabricated in minimum 10'-0" lengths except as noted otherwise. All flashing shall have a minimum 1/2" hemmed edges in exposed locations. Provide field fabricated miters for components that change direction on the project.

2.06 ACCESSORIES

- A. Separation barrier:
1. Ice/water shield:
 - a. Carlisle Syntec CCW WIP 300HT Water and Ice Protection Self-Adhering Roofing Underlayment.
(1) Or an approved equal.
 - b. 25 mil self-adhering sheet, non-skid polyethylene film laminated to a thick layer of butyl adhesive.
 - c. No mud shall be allowed on ice/water shield.
- B. Flashings and accessories:
1. Provide all caps, trims, copings, fascias, corner units, flashings, closures and clips.

2. Fabricate of the same material as that of the roofing panel. Finish to match panel.
 3. Step flashing at juncture vertical wall:
 - a. The sides of the masonry wall shall be flashed using pieces of base flashing installed with each course of shingles. The upper edge of each piece of flashing shall extend 2" above each course of shingles. The lower edge shall be 1/2" above the butts of the shingles forming the next course. The base flashing shall extend up the wall and onto the roof a minimum of 4".
 - b. The counter flashing shall be installed in a raggle left by the mason in steps as shown. Lead wedges or tension forming shapes shall be used to hold the flashing in place and raggle shall be filled with sealant.
 - c. The length of each piece of counter flashing shall vary with the slope of the roof, but no step shall be more than 3 brick high. The width will vary, but shall always be wide enough to cover 4" of the base flashing.
 4. Gutters and downspouts:
 - a. Continuous, extruded gutter with expansion joints to avoid lapped gutter joints.
 - b. Coordinate with Section 07 62 00, Sheet Metal Flashing.
 - c. Size and profiles as indicated on the Drawings.
 - d. Fabricate of the same material as that of the roofing panel. Finish to match panel.
 - e. Fabricate gutters in continuous rolls with joints as maximum allowable lengths per SMACNA.
- C. Sealant: Color coordinated primerless silicone or high grade, non-drying butyl as recommended by panel manufacturer. Do not use sealant containing asphalt.

2.07 SNOW GUARDS

- D. Description:
1. Sno Gem Original Metal Snow Retention System..
 - a. Or an approved equal.
 2. Powder coated extruded aluminum finish in color to match roof.
 3. Profile: Pyramid.
 4. Size: 2-1/2" high X 3-1/2" wide X 3-1/3" depth.
 5. Mechanically attach to each seam in staggered pattern.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. Examine alignment and placement of building roof structure before proceeding with installation of preformed metal roofing.
- B. Examine metal roof deck before starting installation. Deck must be clear, clean and smooth, free of depressions, waves, or projections, dry and must remain dry and free of ice and snow, after roofing application commences. Deck flutes must be clean and dry.
- C. Field check dimensions and check support alignment with taut string or wire. Support misalignment may cause additional stresses in the panels and contribute to oil canning.
- D. Do not proceed with installation until conditions are satisfactory. Notify the architect in writing of unsatisfactory conditions.
- E. Owner will inspect after installation of ice/water shield, before installation of metal roof panels.

3.02 INSTALLATION:

- A. General Requirements:
 - 1. Install roofing and flashing in accordance with approved shop drawings and manufacturer's product data, within specified tolerances.
 - 2. Isolate dissimilar metals, masonry and concrete from metal roof system with bituminous coating.
 - 3. Anchorage shall allow for thermal expansion and contraction without stress or elongation of panels, clips or anchors.
 - 4. Coordinate flashing and sheet metal work to provide watertight conditions at roof terminations. Fabricate and install in accordance with standards set forth in the SMACNA Manual using continuous cleats at all exposed edges.
- B. Underlayment:
 - 1. Install proper protection to substrate (roof deck insulation) to prevent moisture infiltration to roofing assembly prior to placement of panels. Cover complete roof area to receive metal roof panels with an underlayment membrane at the eaves, ridges, hips, valleys, rake walls, rake edges, and around all penetrations.
 - 2. Rigid Insulation board: Insulation Board with minimum 1.5 pound density. See Section 07 22 16.
- C. Preformed Metal Panels:
 - 1. Fasten anchor clips with fasteners as recommended by the manufacturer as required to meet the performance criteria specified.
 - 2. Install starter and edge trim before installing roof panels.
 - 3. Remove strippable plastic film prior to installation of roof panels.
 - 4. Erect metal roofing with lines, planes, rises and angles sharp and true, and plane surfaces free from objectionable warp, dents, buckle or other physical defects.
 - 5. Do not allow traffic on completed roof.
 - 6. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
 - 7. Remove and replace any panels or flashing components that are damaged beyond successful repair.
- D. Flashing:
 - 1. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for installation work where the manufacturer's approved shop drawings do not define a specific detail.
 - 2. Conceal fasteners and expansion provisions wherever possible.
 - 3. Hem all exposed edges of sheet metal flashing that are exposed with at least 1/2" fold under.
 - 4. Insert metal flashing into reglets, anchor with wedges and seal all joints.
 - 5. Set sheet metal items level, true to line and plumb.
 - 6. Secure all metal flashing to wood nailers with screws as indicated on the approved shop drawings.
 - 7. Use cleats to keep flashing endlaps closed when face width exceeds eight (8) inches.

3.03 FIELD QUALITY CONTROL

- A. Tolerances:
 - 1. Applicable erection tolerances: Maximum variation from true planes or lines shall be 1/4" in 20'-0" or 3/8" in 40'-0".
 - 2. Metal roof systems can not correct any previously installed support or wood nailer problems that do not meet the above tolerances.
- B. Manufacturer's Field Service:

1. Manufacturer's representative shall inspect all Watertight Warranted projects during the installation of the metal roof system.
2. Inspections shall be scheduled as required by the manufacturer of the roofing system.
3. Three mandatory visits are required: Notify the Owner when visits are to be scheduled.
4. Inspection of substrate and proper underlayment.
5. Inspection of proper panel and flashing installation.
6. Final inspection upon completion of the metal roof installation.
7. Upon final inspection a report will be issued to the installer of any discrepancies and requirements for additional work. If additional work required the manufacturer will provide another final inspection to verify acceptance of completed work.

3.04 CLEANING

- A. Clean exposed surfaces of work promptly after completion of installation. To prevent rust from staining the painted finish immediately remove filings produced by drilling or cutting.
- B. Clean roof in accordance with manufacturer's recommendations.
- C. Touch up minor abrasions and scratches in finish. Excess scratches shall require panel removal.
- D. Remove all scrap and construction debris from the site.

END OF SECTION