

SECTION 07 41 13 METAL ROOFING MASTER SPECIFICATION

PART I - GENERAL REQUIREMENTS

1.01 DESCRIPTION OF WORK:

A. Section Includes:

The extent of each type of preformed metal roofing panel as indicated on the drawings and by the provisions of this section. The scope of work includes, but shall not be limited to: 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, 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 as indicated by Contract Documents.

1.02 RELATED SECTIONS:

- A. Section 05120: Structural Steel Framing
- B. Section 05310: Steel Roof Deck
- C. Section 05500: Miscellaneous Metal Fabrication
- D. Section 06100: Rough Carpentry
- E. Section 07210: Building Insulation
- F. Section 07600: Flashing and Sheet Metal
- G. Section 07900: Sealant

1.03 REFERENCES:

- A. American Iron and Steel Institute (AISI), Specification for the Design of Cold-Formed Steel Structural Members (2008).
- 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 (2003 edition).
- E. Underwriter's Laboratory (UL) Roofing Materials and Systems Directory:
 - 1. Roofing Materials and Systems Directory listings and classifications of Underwriter's Laboratory roofing construction assemblies.

1.04 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.

1.05 SUBMITTALS

- A. LEED Submittals for Sustainable Design Requirements (OPTIONAL):
 - 1. Product Test Reports for Credit SS 7.2: For roof panels, indicating that panels comply with solar reflectance index requirement. Submit roof material's reflectance and emittance values in addition to calculated SRI.

2. Product Data for Credit MR 4.2: Indicating percentages by weight of postconsumer and pre-consumer recycled content for products having recycled content.
 - a. Include statement indicating costs for each product having recycled content.
3. Documentation for Credit MR 5.2: For materials showing locations and origin of material extracted, harvested or recovered, as well as manufactured within 500 miles of the project site.
 - a. Include statement indicating product name, material manufacturer, total product cost, percentage of product, by weight that meets both the extraction and manufacturer criteria, distance between the project site and extraction/harvest/recovery site, and distance between the project site and the final manufacturing location.
4. Energy Performance: Provide roof panels with solar reflectance index not less than 29 when calculated according to ASTM E 1980 based on testing identical products with a roof slope > 2:12 by a qualified testing agency.

B. Shop Drawings Submittals:

1. Manufacturer of the metal roof system shall provide complete shop drawings in accordance with the requirements specified in Section 01340.
2. Shop drawings must be submitted and returned as acceptable prior to the beginning of product production.

C. 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.

D. Quality Control Submittals:

1. Submit shop drawings signed by a registered licensed engineer certifying the design of the roof system meets the specified performance criteria.

1.06 QUALITY ASSURANCE:

A. Qualification of installers:

1. Competent and skilled sheet metal applicators familiar with Dimensional Metals' 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 and is an approved installer with company-issued documentation accordingly.
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 multi-station 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. Portable on-site rollformers may not be used unless roof panels exceed 90' in length.

C. Product Substitutions:

1. Substitutions to the specified systems shall be submitted to the Architect no later than fifteen (15) days prior to the official bid date. Acceptance of any substitutions shall be put forth in written addendum within ten (10) days prior to the official bid date.
2. No product substitutions will be permitted without meeting all of the performance criteria set forth in this specification.
3. No product substitutions shall be submitted after the official bid date.
4. Product substitutions, when submitted, must include all applicable testing documentation defined in paragraph 1.04.C, panel sample profiles, appropriate panel descriptions and/or literature for review, and a list of 3 successfully installed projects of similar scope and complexity including supervising architectural firm or owner for those projects.

1.07 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.

1.08 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.

1.09 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 D4214-98
- B. Furnish manufacturer's Standard Watertightness Warranty for a period of (select one of the following three warranty periods) [five (5) years, ten (10) years or twenty (20) years] after the date of substantial completion. Entire source of material and labor shall be the sole responsibility of one subcontractor.
 - 1. Warranty shall be limited to the value of the metal roofing system, installed and is non-prorated.
 - 2. Warranty shall be signed by the manufacturer of the metal roof system and his authorized installer, agreeing at their option to replace or repair defective materials and workmanship as required to maintain the metal roof system in watertight condition.
 - 3. Warranty shall not exclude any conditions such as flashing, valleys, penetrations, etc. that are an integral part of the roof system.
 - 4. The manufacturer of the metal roof system shall review installation details and perform on site inspections as required to certify proper watertight roofing material installation.

PART 2 - PRODUCT

2.01 MANUFACTURER

- A. **Dimensional Metals, Inc., 58 Klema Drive North, Reynoldsburg, Ohio 43068.**
- B. Additional manufacturers approved to bid this project are listed below. Being listed as a prequalified manufacturer does not release the manufacturer from providing a similar product that meets the performance criteria as listed in this specification. It is the responsibility of the manufacturers to provide evidence of meeting the specification parameters.

2.02 SHEET MATERIALS

- A. Select one of the following 2 options:
 - 1. FOR ACRYLUME - Unfinished base sheet material shall be 24 Gauge (.024") Galvalume Plus Clear Acrylic Coated Aluminum-Zinc Alloy Coated Steel meeting ASTM A792.
 - 2. FOR KYNAR[®] COLOR COATED - Prefinished base sheet material shall be 24 Gauge (.024") Galvalume Aluminum-Zinc Alloy Coated Steel Grade C meeting ASTM A792.
- B. 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.
- C. Finish color shall be selected by the architect from the manufacturer's current standard 26 standard colors and 4 metallic finishes on their color selection guide. Unless otherwise noted all products shall be of the same finish and color.
- D. 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.

2.03 PREFORMED METAL ROOFING SYSTEM

- A. Preformed Metal Panels: [Enter Data From Cut Sheet Into This Section]
 - 1. System Name:
 - 2. Model Number:
 - 3. Seam Height:
 - 4. Seam On-center:
- B. Standing seams shall incorporate a continuous engineered interlocking connection with concealed anchor clips that prevents the entrance of water passage (select for engineered snap-together panels). Or, standing seams shall incorporate a continuous mechanically seamed connection with concealed anchor clips that prevents the entrance of water passage (select for mechanically seamed panels).
- C. Standing seams shall contain factory injected non-curing sealant that runs continuously throughout the panel length as job conditions dictate.

- D. Panel clips shall be as recommended by the manufacturer to meet the performance criteria of this specification.
- E. All exposed adjacent flashing shall be of the same material and finish as the roof panels.
- F. 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 # 10-13- 1" or # 10-16 - 1" long pancake head #2 Phillips drive screw as required to meet the performance criteria in this specification.
 - 4. Concealed fasteners for flashing attachment shall be # 10-13- 1" or # 10-16- 1" 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 for panel attachment as dictated by warranty requirements for longitudinal thermal expansion and contraction, or as indicated on the shop drawings.
- G. 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.
- H. 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.
- I. Underlayment:
 - 1. Install approved polypropylene sheet material in 10 square rolls equal to the product listed, applied in shingle-like application in continuous coverage from eave to ridge per roof area with approved mechanical attachment procedures. See "Part 3—Execution."
 - a. DMI DynaClad® Premium Roofing Underlayment
 - 2. Consult DMI for self-adhering ice and water underlayment approval for use in critical areas such as valleys, aprons, rakes, rake walls, and penetrations, particularly as they apply to watertight warranty requirements. See "Part 3--Execution."

2.04 FABRICATION

- A. Panels shall be fabricated in permanent fabrication facilities in continuous lengths as required and indicated in paragraph 1.6.B. No horizontal end lap joints will be accepted,

unless panels exceed 90' in length or jobsite conditions dictate.

- 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 (2003 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 3/4" hemmed edges in exposed locations. Provide field fabricated miters for components that change direction on the project.
- F. All gutter to be in continuous lengths up to 50 feet per the listed product in this paragraph. Expansion joints are to be utilized so as not to have lapped gutter joints.
 - 1. DMI CG70 - 7" Continuous Gutter

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. Underlayment Installation:
 - 1. Verify that DMI DynaClad® Underlayment has been installed over solid substrate.
 - 2. Ensure DMI DynaClad® underlayment is installed horizontally, starting at the eave working to the ridge with a 6" minimum overlap as described in paragraph 2.03.I.
 - 3. Ensure that all fasteners are totally flush with the substrate.

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 finished substrate to prevent moisture infiltration to roofing assembly prior to placement of panels. Cover complete roof area to receive metal roof panels with a self adhered ice and water underlayment membrane or a combination of DMI DynaClad® and self adhered ice and water underlayment at the eaves, valleys, rake walls, rake edges, and around all penetrations as described in paragraph 2.03.1.
- 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 3/4" 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 end laps 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 lies 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. Two mandatory visits are required:
 - a. Inspection of proper panel and flashing installation.
 - b. Final inspection upon completion of the metal roof installation.
4. 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 with manufacturer's supplied Kynar® touch up paint.

- D. Remove all scrap and construction debris from the site.

END OF SECTION