SECTION 07 61 13
METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vapor retarder.
2. Roof insulation.
3. Standing seam metal roofing.
4. Prefinished gutters and downspouts.
5. Soffit panels.
6. Sheet metal work required for roofing.
7. Insulated curbs for roof penetrations of ductwork, flues etc.

B. Related Specification Sections include but are not necessarily limited to:
1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 06 10 00 - Rough Carpentry.
4. Section 08 62 00 - Skylight.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
1. American Architectural Manufacturers Association (AAMA):
   a. 621, Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
2. ASTM International (ASTM):
   a. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   b. A792/A792M, Standard Specification for Steel Sheet, 55 PCT Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
   c. C209, Standard Test Methods for Cellulosic Fiber Insulating Board.
   d. C1289, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
   e. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
   f. D1970/D1970M, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   g. D4833/D4833M, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
   h. E96/E96M, Standard Test Methods for Water Vapor Transmission of Materials.
   i. E1592, Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
   j. E1646, Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
   k. E1680, Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
   l. E1745, Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
   m. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
3. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
   a. Architectural Sheet Metal Manual.

4. Underwriters Laboratories, Inc. (UL):
    a. Building Materials Directory.
    b. Fire Resistance Directory.
    c. 580, Standard for Tests for Uplift Resistance of Roof Assemblies.
    d. 790, Standard Test Methods for Fire Tests of Roof Coverings.
    e. 1256, Standard for Fire Test of Roof Deck Constructions.

B. Qualifications:
1. Manufacturer shall have minimum of 10 years of experience in the production of structural standing seam metal roofing.
    a. All structural components of the roof system shall be designed and sealed by registered professional structural engineer licensed in the State ofWashington.
2. Installing contractor shall be licensed or approved in writing by manufacturer.
3. Contractor and installer shall have minimum of seven years of experience in the installation of structural standing seam metal roof systems similar to system specified.
4. Contractor and installer shall have successfully completed two projects of similar size, scope and complexity within past two years.

C. Completed roof system to be inspected by roof manufacturer's authorized factory trained representative prior to issuance of roof warranty.

1.3 DEFINITIONS

A. Installer or Applicator:
1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
2. Installer and applicator are synonymous.

B. Steep Slope: Having a pitch of 3:12 or greater.

C. Low Slope: Having a pitch less than 3:12 but greater than 1/4:12.

D. PVDF: Polyvinylidene fluoride.

1.4 SYSTEM DESCRIPTION

A. Prefinished, field-insulated, structural standing seam metal roof system, including but not limited to:
1. Vapor retarder.
2. Roof insulation.
3. Structural standing seam metal roof panels.
    a. Roof panel support and attachment system to be determined by standing seam roof manufacturer.

B. All flashing and miscellaneous trim required for a complete water and airtight system, including but not limited to:
1. Flashing.
2. Counterflashing.
3. Sealants.

C. Prefinished gutters and downspouts.

1.5 SUBMITTALS

A. Shop Drawings:
1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
2. Fabrication and/or layout drawings:
    a. Manufacturer prepared computer generated Drawings showing anchorage, flashing, jointing and all other accessories required and all special detailing required by the system.
        1) Minimum plan scale: 1 IN = 8 FT.

2) Minimum detail scale: 1-1/2 IN = 1 FT.
b. Provide complete erection plan for each building structure with all details and sections referenced, all penetrations shown, expansion joints shown, detailed and referenced, and all special conditions identified, referenced and detailed.
c. Erection plan to identify limits of each different substrate material (decking).
d. Provide distinction between factory and field assembled work.

3. Product technical data including:
   a. Manufacturer data sheets on each component, including masonry reglets used in the roof system.
   b. Acknowledgement that products submitted meet requirements of standards referenced.
      1) Certification by manufacturer that roofing assembly being supplied has been successfully tested under UL 580 procedures and has achieved a Class 90 rating.
4. Test results:
   a. UL 580, Class 90 test data.
   b. ASTM E1592 test results.
      1) Provide results of tests conducted in accordance with ASTM E1592 for panel size and gage and clip type and spacing similar to panels and clips being used.
   c. ASTM E1646 and ASTM E1680 test results.
   d. Concentrated load test data.
      1) Load test to be conducted on panel size, gage and with clip spacing as required.
5. Qualifications:
   a. Manufacturer: Provide structural engineer qualifications.
   b. Contractor:
      1) Certification of approval or license to install product from manufacturer.
      2) Certification of experience.
      3) Listing of projects completed in the past two yeas with similar scope.
      4) Completed projects information to include, square footage of roofing installed, dollar value of roofing installed, manufacturer and type of roofing installed and contact name and telephone number of building Owner.
   c. Installer: Provide qualifications of all personnel expected to be working on the Project.
6. Roofing manufacturer's letter of approval for insulation proposed for use.
7. Warranty: Sample language of manufacturer's warranty to be provided on this Project.
8. Structural Engineer's sealed and signed calculations certifying that system structural components meet the requirements for lateral, upward and downward loads specified.

B. Samples:
1. General: Tag, identify and provide statement regarding use for all fasteners, anchor clips, closures and sealants.
2. Roof panel:
   a. Two samples, full width, 24 IN long.
   b. Provide color selected or specified when possible.
3. Fasteners.
4. Anchor clips.
5. Closures, (both metal and non-metallic).
6. Factory and field applied sealants.
7. Color samples:
   a. For initial preliminary color selection, provide manufacturer's color chart showing all colors available.
   b. For final color selection, provide two 2 IN x 3 IN colored metal samples, for each color selected during the initial color selection.

C. Contract Closeout Information:
1. Operation and Maintenance Data:
   a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

D. Informational Submittals:
   1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
   2. Final warranty.

1.6 WARRANTY

A. Provide year complete system warranty, including for air and weather tightness of entire roof assembly signed by manufacturer.
   1. Warranty limits shall meet the minimum load capacity requirements of ASTM E1592.

B. Provide manufacturer's 20 year warranty on panel finish against fading, chipping, cracking and peeling of the panel exterior finish and/or erosion of substrate metal.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed and other manufacturers not listed, but capable of meeting this Specification Section, are expected to provide a system with similar profile, standing seam height, spacing, construction and factory applied finish.

B. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Metal roofing:
      a. CENTRIA by NCI Building Systems.
      b. AEP Span.
      c. Other manufacturers capable of providing structural standing seam system and profiles similar to that specified will be considered.
   2. Vapor retarder:
      a. Griffolyn by Reef Industries, Inc.
   3. Insulation:
      a. Any manufacturer meeting these specifications and approved by metal roofing manufacturer.
   4. PVDF resin:
      a. PPG IdeaScapes - DURANAR.
      b. Valspar - Fluropon.
      c. Arkema - Kynar 500.
      d. Solvay - Hylar 5000.
      e. Solvay - Hylar 5000.
   5. Snow retention system:
      a. S-5! Attachment Solutions by Metal Roof Innovations, Ltd.
   6. Soffit panels: Provided by metal roofing panel manufacturer.

C. Submit request for substitution in accordance with Specification Section 01 25 00.

2.2 MATERIALS

A. Roof Panels:
   1. General:
      a. Galvalume steel, ASTM A792/A792M, Class SS, Grade 50B.
         1) Painted surfaces: AZ50.
         2) Unpainted surfaces: AZ55.

B. Insulation:
   1. Rigid polyisocyanurate.
      a. Approved by roofing manufacturer.

C. Perimeter Trim, Panel Closures, Flashing and Counterflashing: Material and factory applied finish to match roof panels.

D. Fasteners: 300 series stainless steel, ASTM F593.

E. Intermediate Support System:
   1. Galvanized steel: ASTM A653/A653M, Class SS, Grade 50, G90.

F. Sealant: Manufacturer's standard non-curing butyl.

2.3 ACCESSORIES

A. Gutters and Downspouts:
   1. General:
      a. Galvalume steel, ASTM A792/A792M, Class CS.
         1) Painted surfaces: AZ50.
         2) Unpainted surfaces: AZ55.
         3) Minimum thickness: 22 GA.
         4) All exposed surfaces to have finish and color to match roofing metal.
   2. Gutters:
      a. "Style A" gutter per SMACNA Figure 1-2.
         1) Seamless except for expansion joints.
      b. Gutter straps and eave closure flashing: Match gutter material, finish and color.
   3. Downspouts:
      a. SMACNA Figure.
         1) Seam on concealed side of downspout.
         2) Provide gutter to downspout connection per SMACNA Figure 1-33B, Detail 1.
      b. Hanger straps: Material and finish to match downspouts.

B. Vapor Retarder:
   1. ASTM E1745, Class A rated.
   2. Water vapor permeance: ASTM E96/E96M, 0.03 maximum.
   3. Tensile strength: ASTM D882, 275 FT-LB.
   4. Puncture strength: ASTM D4833/D4833M, 72 FT-LB.
   5. Griffolyn Type 105.
   6. Vapor retarder tape: As recommended by vapor retarder manufacturer.

C. Vapor Retarder (Fire Rated):
   1. Water vapor permeance: ASTM E96/E96M, 0.03 maximum.
   2. Tensile strength: ASTM D882, 180 FT-LB.
   3. Puncture strength: ASTM D4833/D4833M, 47 FT-LB.
   4. Fire retardancy:
   5. NFPA 701: Pass.
   6. Flame spread: ASTM E84, 5 maximum.
   7. Smoke developed: ASTM E84, 80 maximum.
   8. Griffolyn Type 90-FR.
   9. Vapor retarder tape: As recommended by vapor retarder manufacturer.

D. Roof Insulation:
   1. Rigid polyisocyanurate foam board.
      a. ASTM C1289, Class I, Type II.
      b. Compressive strength: 20 PSI minimum.
      c. Density: 2 PCF minimum.
      d. Thermal resistance (R-Value): 7.2/IN.
      e. Water vapor transmission: ASTM E96/E96M, less than 1.0 perms.
      f. Water absorption: ASTM C209, less than 1.0 PCT.
      g. Thickness noted on Drawings.
      h. Acceptable to roof manufacturer.

E. Roof Penetration Flashing:
   1. Round penetrations:
      a. Premolded EPDM boot with metal collar.

b. Buildex "DEK-TITE."

F. Flashing Curb:
1. Provided by metal roofing manufacturer.
2. One-piece completely seal welded prefabricated roof curb, including vertical flashing, and counter flashing, cricket on high side of penetration and flat pan fabricated to replace standing seam metal roof panel.
3. Size as required for penetration.
4. Bottom sloped to match roof.
   a. Level on top.
5. Minimum 16 GA galvannealed steel.
   a. Finish to match roof panel.

G. Foam and metal closures, sealant, gaskets, fasteners, washers, clips, angles, and all miscellaneous trims shall be provided by roofing manufacturer, fabricated for the specific condition as required.

H. Soffit Panels:
1. Minimum 0.032 IN aluminum, ASTM B209.
2. Factory applied finish to match roof panels.
3. AAMA 2605.
4. Profile: Flat interlocking sheet with reinforcing ribs as required to prevent warping and oil canning.
5. Panel joints shall match standing seam spacing of roof panels when possible.
6. Provide soffit vent panels where indicated on Drawings.
   a. If not indicated, provide vent panels at maximum 4 FT OC with minimum of three vent panels per side of building.
   b. Vent panels shall be compatible with and supported by soffit panel systems.
   c. Vent panels shall have minimum 10 PCT free area and shall have the maximum amount of panel face perforations allowed structurally.
      1) Perforations to be in the form of holes, minimum 3/32 IN and maximum 1/8 IN DIA, equally spaced on staggered centers from row to row.
   d. Vent panels shall be same size and profile as solid panels.
      1) Factory applied finish to match solid panels.
7. Hat shaped steel channel sub-framing:
   a. 1 IN deep x 20 GA steel.
   b. Galvanized, ASTM A653/A653M,.

2.4 FABRICATION

A. General:
1. Fabricate with square, true corners, mitered and welded.
2. Fabricate trim, flashings and closure pieces to match panel profile and finish.
3. Hem all edges.
4. Fabricate panels in full length with no end laps.

B. Standing Seam Metal Roof Panels:
1. Profile: Similar to Centria "SRS" System.
2. Height of standing seam: 2 IN.
3. Width:
   a. 16 IN.
   b. Longitudinal stiffening elements to minimize oil canning.
4. System shall be designed as a true structural standing seam shape.
5. Finish:
   a. PVDF based with minimum 70 PCT resin.
   b. Three-coat system having minimum 0.8 MIL epoxy primer coat on both sides of panel with a 0.8 MIL PVDF resin color coat and a 0.8 MIL PVDF resin clear top coat on the exterior side of the panel.

c. Meet or exceed requirements of AAMA 621.
d. Smooth finish.
e. Color:
1) To be selected from manufacturers full range of primary and secondary colors.
a) Does not include exotic, metallic flake or iridescent colors.

6. Concealed fasteners:
a. Provide concealed fasteners in all locations.
b. If exposed fasteners are required by the roof panel manufacturer, because of location, constructability issues or other critical design requirement, finish of fastener shall match roof panel finish.
1) Exposed fasteners are to be approved by Engineer.
c. The use of deflection limiter devices is not allowed.

C. Intermediate Support System:
1. Roof panel anchor clips:
a. Manufacturer's standard one-piece clip suitable for condition.
1) Two-piece clips are acceptable if required by roofing manufacturer.
b. Minimum 16 GA steel.
1) Galvanized, ASTM A653/A653M, G90.
2. Roof panel manufacturer shall be responsible for designing and providing all necessary intermediate "Z" or "hat-shaped" or other miscellaneous support members as required to transfer roof panel loads into building roof framing members.
a. Design in accordance with building code.
3. Bearing plates:
a. Sized by roofing manufacturer for roof loading indicated.
b. Minimum 16 GA steel.
1) Galvanized, ASTM A653/A653M, G90.

2.5 SOURCE QUALITY CONTROL

A. Roof assembly to be Class A roof covering assembly per UL 1256.

B. Structural Testing:
1. The system shall be designed to safely resist the positive and negative loads per the building code and as shown on Drawings.
2. Structural-uniform uplift load capacity of the panel system shall be determined in accordance with ASTM E1592.
a. The factor of safety on the test results shall be 1.65 for the panel, batten or clip ultimate loads with no increase for wind.
b. The factor of safety for fasteners shall be 3.0 for one single fastener per clip, 2.25 for two fasteners per clip and 4.0 IN masonry.
c. Design uplift capacity for conditions of gage, span or loading other than those tested may be determined by interpolation of test results.
1) Extrapolation of conditions outside the range of the tests is not acceptable.
d. Deflection shall be L/180 for positive loading.

C. Water Penetration: No uncontrollable leakage at minimum when tested in accordance with ASTM E1646.

D. Air Infiltration: Maximum SCFM/SQFT when tested at 4.0 PSF differential pressure when tested in accordance with ASTM E1680.

E. Fire Resistance/Wind Uplift Rating:
1. UL 790, Class 1.
2. UL 580, Class 90.

F. The panels shall withstand a 250 LB concentrated load applied to a 4 SQIN area at the center of the panel at mid span between supports with no panel deformation, rib buckling, or panel sidelap separation which will adversely affect the weather tightness of the system.

G. Support roofing panels on top of roof insulation using bearing plates attached to the structural frame or connect to manufacturer-provided intermediate support system.
   1. Bearing plate and standing seam roof panel anchor clip attachment is to be determined by the roofing manufacturer and shall take precedent over this Specification.
      a. Provide attachment to roof structural frame or deck as required for loading criteria specified.
   2. Roof panel anchor clips shall be designed to allow thermal movement of the panels except where specific fixed points are indicated.
      a. Roof panel manufacturer shall be responsible for determining fixed point locations unless otherwise indicated.
   3. Wood blocking shown at roof edge is strictly for attachment of miscellaneous flashings and shall not be used for any structural value.
   4. Maximum spacing of roof clips shall be determined by manufacturer.

H. Roof panel manufacturer shall be responsible for designing and installing all necessary expansion joints in the roof system.
   1. Where roof expansion joints occur, provide corresponding expansion joints in fascia, soffit and gutters.

2.6 MAINTENANCE MATERIALS

A. Provide Owner with 4 OZ of touch-up paint to match each different color used in the system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Install products in accordance with manufacturer's instructions, SMACNA (where referenced) and details shown on Drawings for a complete weathertight installation without waves, warps buckles or distortions.
      a. Provide all closures, trim, angles, plates, sealant, gaskets, fasteners, washers, etc., as necessary.
   2. Attachments shall allow for thermal expansion and contraction.
   3. Seal all joints as required for watertight installation.
   4. Touch-up paint all damaged surfaces.

B. Vapor Retarder:
   1. Install on winter warm side of roof assembly in accordance with manufacturer's recommendations.
   2. Lap joints minimum: 4 IN.
   3. Seal to perimeter, tape all joints and repair all tears.

C. Roof Insulation:
   1. Install in accordance with manufacturer’s recommendations.
   2. If multiple layers are provided to achieve total thickness as shown on Drawings, stagger joints minimum 12 IN in each direction.

D. Standing Seam Roofing Panels:
   1. Install in one continuous length from ridge to eave.
   2. Exception: Panels with skylights or mechanical openings.
   3. Hand crimp battens at each clip.
   4. Seam panels and battens together with portable electric seaming machine supplied by the manufacturer.

E. Soffit Panels:
   1. Install in accordance with manufacturer's recommendations using concealed fasteners when possible.
   2. Exposed fasteners to be painted to match soffit finish.

F. Gutters:
   1. Install gutters using gutter straps in accordance with SMACNA Table 1-8 and Figure 1-12 and per roofing manufacturer's recommendations.
      a. Provide gutter brackets or hangers at 24 IN OC maximum.
      b. Provide expansion joints in gutters per SMACNA and at expansion joint locations shown on Drawings.
      c. Install gutters to provide positive drainage to downspout locations.
      d. Seal all joints in gutters to provide completely water tight system.

G. Downspouts:
   1. Install downspouts in locations shown on the Drawings.
   2. Provide downspout hanger straps per SMACNA Figure 1-35 as appropriate for downspout style.
   3. Provide gutter to downspout connection per SMACNA Figure 1-33B, Detail 1.
   4. Seal all joints in downspout for a complete watertight system.
      a. Angle bottom of downspout out away from building.
   5. Fasten hanger straps to building wall with stainless steel screws and anchor sleeves appropriate for wall construction.
      a. Provide minimum of two fasteners per strap.
   6. Maximum spacing of hanger straps shall be 10 FT with minimum of two hanger straps per vertical piece of downspout.
   7. Spacing and location of hanger straps shall be consistent from downspout to downspout.

END OF SECTION