

## SECTION 07 41 13 – Metal Roof Panels

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes: Prefinished, prefabricated architectural standing seam roof system with continuous interlocking seams.
- B. Related Requirements:
  1. Section 05 10 00: Structural Metal Decking.
  2. Section 05 40 00: Cold-Formed Metal Framing.
  3. Section 05 50 00: Metal Fabrications.
  4. Section 06 10 00: Rough Carpentry
  5. Section 07 22 00: Roof Insulation
  6. Section 07 62 00: Sheet Metal Flashing and Trim
  7. Section 07 71 00: Sheet Metal Roof Accessories/Roof Specialties
  8. Section 07 92 00: Joint Sealants.

#### 1.3 REFERENCES

- A. Reference Standards:
  1. ASCE 7-10: Minimum Design Loads for Buildings and Other Structures.
  2. ASTM A653/A924: Steel Sheet, Zinc Coated (Galvanized) Class G90 by the Hot Dip Process (Prepainted G-90 is generally available in the Pacific Northwest as a standard).
  3. ASTM A792: Steel Sheet, Aluminum/Zinc (Galvanized), AZ-50 (painted), AZ-55 (unpainted) by the Hot Dip Process. (Prepainted AZ-50 is generally available in California and the Southwest as a standard).
  4. ASTM B209 Specification for Aluminum and Aluminum- Allow Sheet and Plate
  5. CRRC-1 Method #1: Measuring Solar Reflectance of a Flat, Opaque, and Heterogeneous Surface Using a Portable Solar Reflectometer.
  6. SMACNA Architectural Sheet Metal Manual.
  7. UL 580: Standard for Tests for Uplift Resistance of Roof Assemblies. UL-90 Wind Uplift Rating.
  8. UL-790: Standard for Fire Resistance and Roof Covering Materials.
  9. US Environmental Protection Agency: Energy Star Reflective Roof Products
  10. US Green Building Council (USGBC): Leadership in Energy and Environmental Design (LEED)

## 1.4 SUBMITTALS FOR INFORMATION

- A. Product Data.
- B. Design and Test Reports: Provide the following certified test reports from an independent testing laboratory:
  - 1. Independent laboratory testing report, stamped by a licensed engineer, for system design load and seam integrity.
  - 2. Professional engineer's documentation that roofing system incorporated sufficient allowance for stress and movement.
  - 3. A letter signed by an officer of the manufacturing company certifying that the materials furnished for this project are the same as represented in the tests and supporting data.
  - 4. Manufacturer's verifications that the panels are factory roll formed. (or formed by portable equipment approved through UL's Follow-Up Service when panel lengths exceed 62 feet).
- C. Mill production reports certifying that the steel thicknesses are within allowable tolerances of the nominal or minimum thickness or gauge specified.
- D. Shop Drawings:
  - 1. Indicate thickness and dimensions of parts, fastenings and anchoring methods, details and locations of joints, transitions and other provisions necessary for thermal expansion and contraction.
  - 2. Indicate locations of field-applied sealant.
- E. Samples:
  - 1. Submit two samples, 12 inches long by full panel width, showing proposed metal thickness and seam profile.
  - 2. Submit standard color samples of metal for Architect's selection.
- F. Manufacturer Qualifications: Add manufacturer's signed letter supporting both financial capability and at least 5 projects of comparable size with architect and contractor contact information.
- G. Installer Qualifications: Submit list of five completed projects, with names and contact information for architects and contractors. Submit signed letter from Manufacturer demonstrating completion of manufacturer's certified installation class.
- H. Test Reports: Indicate compliance of products with project requirements.
- I. LEED Submittals:
  - 1. LEED Credit SS 7.2 – Heat Island Effect – Roof: Product data indicating Solar Reflectance Index (SRI) of roof panels.
  - 2. LEED Credit MR 4 – Recycled Content: Product data indicating percentage by weight of post-consumer and post-industrial recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.

- J. Warranty Documentation: Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the Manufacturer, installing contractor, and the Owner.
- K. Any material submitted as equal to the specified material must be accompanied by a report reviewed by a professional engineer licensed in the state in which the installation takes place. This report shall show that the submitted equal product(s) meets the Design and Performance criteria in this specification. Substitution requests submitted without licensed engineer approval will be rejected for non-conformance. The owner's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.
- L. Insurance Documentation: Provide current Certificate of Insurance showing a min. of \$2,000,000 liability coverage per occurrence.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
  - 1. Ten years' experience, minimum, in the factory fabrication of metal panels.
  - 2. Manufacturer shall carry \$2,000,000 liability insurance, minimum, for metal panel system.
- B. Installer Qualifications:
  - 1. Three years' experience, minimum, in the successful application of metal roof or wall panels.
  - 2. Five satisfactory projects with metal panel work of similar product(s), scope and complexity to Work of this Project.
  - 3. Installer must be approved by manufacturer, in writing, prior to bid. Approval document must be included with project bid.
- C. Testing Agency Qualifications: Agency compliant with ISO/IEC Standard 17025, or an accredited independent agency recognized by the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement or ANSI.
- D. Source Limitations: Obtain all components of roof system (including underlayment) from a single manufacturer, including roll goods materials if required. Secondary products that are required shall be recommended and approved in writing by the roofing system manufacturer.
- E. Alternate Manufacturers: The following manufacturer criteria must be submitted. Alternate systems will not be considered for approval unless each of these items has been submitted for review at least 15 (20) business days prior to bid opening:
  - 1. Submit each item listed in article 1.4 (A through E) for evaluation of the proposed system
  - 2. Tests shall have been made for identical systems within the ranges of specified performance criteria.
  - 3. Empirical calculations for roof performance shall only be acceptable for positive loads with web crippling evaluation.
  - 4. A list of a minimum of five (5) jobs where the proposed alternate material was used under similar conditions. The reference list shall include date of project, size of project, project address, and telephone number of architect/owner contact.
  - 5. A written statement from a corporate officer of the manufacturing company stating that

he or she has reviewed the specifications and confirms that the proposed system meets or exceeds all performance requirements listed as well as meets the panel size, gauge, weight, uplift pressures and height of the vertical seam.

6. Proof that the manufacturer has been in business for a minimum number of years equal to the warranty period required for this project.

F. Mock-Ups:

1. Visual Mock-Up: Construct mock-up (refer to dimensions or drawings) as required to show at least two pattern repeats, and in same orientation, and tie-ins to other roofing or siding products.

## 1.6 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-roofing conference approximately two (2) weeks before scheduled commencement of roofing system installation and associated work.
- B. Require attendance of installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing which must precede or follow roofing work (including mechanical work if any), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, testing agencies and governing authorities.
- C. Objectives of conference to include:
  1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
  2. Tour representative areas of roofing substrates (decks); inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by others.
  3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
  4. Review roofing system requirements (drawings, specifications and other contract documents).
  5. Review required submittals both completed and yet to be completed.
  6. Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
  7. Review required inspection, testing, certifying and material usage accounting procedures.
  8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
  9. Record discussion of conference including decisions and agreements (or disagreements) reached. Furnish a copy of records to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
  10. Review notification procedures for inclement weather or non-working days

- D. The Owner's Representative will designate one of the conference participants to record the proceedings and promptly distribute them to the participants for record.
- E. The intent of the conference is to resolve issues affecting the installation and performance of roofing work. Do not proceed with roofing work until such issues are resolved to the satisfaction of the Owner and Engineer of Record. This shall not be construed as interference with the progress of Work on the part of the Owner or Engineer of Record.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Storage and Handling Requirements:
  - 1. Keep panels and accessory items dry.
  - 2. Protect against damage and discoloration.
  - 3. Handle panels with non-marring slings.
  - 4. Support panels to prevent permanent deformation.
  - 5. Store panels above ground, with one end elevated for drainage.
  - 6. Protect panels against standing water and condensation between adjacent surfaces.
  - 7. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.
  - 8. Painted panels may (depending on material or coating) be shipped with protective plastic sheeting or a strippable film coating between panels. Remove strippable film coating prior to installation. Do not allow strippable film coating to remain on panels in extreme heat, cold, or direct sunlight or other UV source.
  - 9. Do not allow panels to contact treated lumber.
  - 10. Adequately cover/protect metal panels and flashing with tarpaulins, scrim sheeting, or similar protection during transit to prevent dirt and debris from coming in contact with the exposed finished surfaces of finished goods.
  - 11. Protect packaged panels, flashing, and accessories from UV sources, dirt or sand, and precipitation until they are used.
- B. Installer's responsibilities:
  - 1. Stack pre-finished materials to prevent twisting, bending, abrasion and denting and elevate one end to facilitate moisture run-off.
  - 2. Unload panels with equipment that will adequately support the panels to prevent damage. Verify equipment is sufficient to lift the weight of panels while still in crating. Certified riggers may be required
  - 3. Protect moisture-sensitive and water-based materials from the weather.
  - 4. Inspect materials upon delivery. Reject and remove physically damaged or marred material from project site.

## **1.8 PROJECT CONDITIONS**

- A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage and protection requirements for roofing system.
  - 1. Protection:
    - a. Protect completed roofing from subsequent construction operations. Comply with Manufacturer's recommendations.
    - b. Do not overload roof with stored materials.

- c. Roof-mounted equipment shall not be fastened directly to, or mounted on, the standing seam metal roofing system.
- B. Ascertain that work of other trades penetrating the roof/siding substrate is made watertight and approved prior to installation of new metal roofing/siding panel system.

## 1.9 DESIGN AND PERFORMANCE CRITERIA

- A. Thermal Expansion and Contraction.
  - 1. The completed metal roofing system and flashing 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. The design temperature differential shall be not less than [120] °F and based on historical high and low temperatures in the area of the installation.
  - 3. Interface between panel and clip shall provide for adequate thermal movement in each direction along the longitudinal direction. (Panels must provide depth above fastener heads to avoid frictional panel failure (“clip relief”).)
  - 4. Location of metal roofing rigid connector (“PIN point”) shall be at roof ridge unless otherwise approved by the Project Architect and TMP. (Contact TMP representative for other options and drag loading calculations).
- B. Uniform Wind Uplift Load Capacity- based on UL 580 wind uplift test criteria.

## 1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer’s standard (20, 30 or 35)-year performance warranty, stating the following:
  - 1. Architectural fluorocarbon finish: Kynar 500®
    - a. Will be free of fading or color change in excess of 5 Hunter delta-E units as determined by ASTM D2244-02.
    - b. Will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D4214-98 method D659.
    - c. Will not peel, crack, chip, or delaminate.
  - 2. Architectural silicone modified polyester finish:
    - a. Will not peel, crack, chip, or delaminate
- B. Installer's Warranty: Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, covering repairs required to maintain roof panels watertight and weatherproof with normal usage for two years following Project Substantial Completion date.
  - 1. Furnish written warranty, signed by installer.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Products: Provide the following:
  - 1. Taylor Metal Products'; (Clip-Lock or Slim-Lock)
- B. Substitution Limitations: (Substitutions will not be considered), (Substitutions will be considered in accordance with Section 01 25 00 "Substitution Procedures".)
- C. Performance Criteria
  - 1. Wind Uplift: Class 90 per UL 580 (As required by ASCE 7), (Insert- governing code), (Insert required load).
    - a. Deflection Limits: Withstand wind loads with deflections no greater than (1/180 or \_\_\_\_\_) of the span.
  - 2. Thermal Movements: Accommodate thermal movement without buckling, joint opening, overstressing components, failure of connections, or other detrimental effects, through the following temperature changes:
    - a. 120 degrees F, ambient.
    - b. 180 degrees F, material surface.
- D. Sustainability Characteristics:
  - 1. Recycled Content: (28.9), (50), or (75) percent post-consumer recycled content (calculated according to LEED Credit MR 4).
  - 2. Energy Performance:
    - a. Provide Energy Star® qualified product for slope indicated in Drawings.
    - b. Solar reflective index (SRI): Not less than (29)<Insert requirement> per ASTM E1980.
    - c. Reflectance and Emissivity:
      - 1) Solar Reflectance: Not less than (0.25)<Insert requirement> per ASTM test methods C1549 or E1918, or CRRC-1 Method #1.
      - 2) Thermal Emissivity: Not less than (0.75)<Insert requirement> per ASTM C1371.
  - 3. Shipping Distance: Provide panels manufactured at the following factory: (if locally manufactured materials are a project requirement, select factory closer to Project site)
    - a. Salem, Oregon 97301 (Slim-Lock- 1-1/2" Seam)
    - b. Auburn, Washington 98001 (Slim-Lock- 1-1/2" Seam)
    - c. Sacramento, California 95652 (Clip-Lock- 1" or 1-1/2" Seam)
    - d. Riverside, California 92509 (Clip-Lock- 1" or 1-1/2" Seam)
- E. Manufacturing Characteristics: Provide panels complying with provisions of Buy American Act 41 U.S. C 10a - 10d.

## 2.2 PANELS

- A. Products: (Clip-Lock or Slim-Lock - Suitable for slopes of 3" in 12" or greater. Very restricted conditions may allow a lesser slope. Consult a TMP representative for slope design restrictions).
  - 1. Manufacturer
    - a. Taylor Metal Products: 4566 Ridge Drive NE, Salem OR:  
800-574-1388: www.Taylormetal.com
- B. Panels: Basis of Design- 1-1/2" (Clip-Lock or Slim-Lock), (or 1" Clip-Lock), Snap Seam Metal Roof Panel
  - 1. Material: Steel
    - a. 24 Gauge ( 26 or 22 ga. Select gauge according to TMP's performance tables, required span, and applicable loads. 26 and 24 ga. are standard): minimum thickness of .0236" (.020", .0285"). Grade 50 minimum yield and 65 tensile strengths (lesser grades are not allowed).
  - 2. Thickness and yield strength as required for performance indicated: ASTM A653: Steel Sheet, Zinc Coated (Galvanized) Class G90 (or aluminum-zinc alloy coating conforming to ASTM A792, Class AZ50) by the Hot Dip Process. For projects with multiple profiles of varied combinations of profiles, rib patterns and finishes, show on drawings.
  - 3. Panel Width and Pattern: 15-1/2" (or 16-1/2" x 1" Clip-Lock) ,15-1/2" (Slim-Lock)-Consult with TMP representative regarding appropriate width for project requirements and other width options). With (Choose smooth, accent ribs, or striated—striated panels are the most resistant to distortion or "oil canning") pattern.
  - 4. Panel Seam Height: 1-1/2" (1" Clip-Lock).
  - 5. Panel Finish:

Choose one or more of the following exterior finishes.

- a. Polyvinylidene Fluoride, full 70 percent Kynar 500® consisting of a baked-on nominal 0.25 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 25 to 35 when tested in accordance with ASTM D523 at 60 degrees.
- b. Marine Guard™ (Marine or Corrosive environments) consisting of a high-build, corrosion resistant primer, finish coat, and clear top coat (minimums apply).
- c. Silicone Modified Polyester (ArmorTech™), (26 ga. standard finish)
- d. Color: Choose from full range of manufacturer's standard colors, metallics, and custom colors (Custom colors are available on orders of 3,000 lineal feet or more. Consult TMP representative for other requirements).
- e. Zinalume® Plus protective coating for unpainted aluminum-zinc alloy coating.
- f. Panel Color: (As scheduled), (As selected from manufacturer's full range), <insert color>.

## 2.3 FRAMING AND SUBSTRATES

- A. Secondary Framing: See Section 05 40 00 "Cold-Formed Metal Framing".
- B. Sheathing: See Section 06 16 00 "Sheathing".
- C. Roofing Underlayment: (As per Metal Roof Manufacturer's recommendation). **TMP Protect HT™** ice and water shield.



1. Roofing Felt: (<insert requirements>).
2. Self-Adhering Sheet Underlayment: (<insert requirements>).

## 2.4 CLIPS AND FASTENERS

- A. Clips: Provide clip designed to allow panels to thermally expand and contract.
- B. Bearing Plate: (Consult TMP representative regarding thickness and size- 22, 20, 18 ga. 4" x 6" G-90 galvanized minimum)
- C. Fasteners: As recommended by manufacturer for performance indicated (size, length, clip fasteners, trim fasteners). Weather coated per project environment, conditions and substrate.

## 2.5 INSULATION

- A. Rigid Insulation: (See section 07 22 00 "Roof and Deck Insulation")<Insert requirements>
  1. Thermal Spacer Blocks: As recommended by roofing manufacturer.
- B. Fiberglass Insulation: (See section 07 21 00 "Thermal Insulation")<Insert requirements>
- C. Acoustic Insulation: (See section 09 81 00 "Acoustic Insulation")<Insert requirements>

## 2.6 ACCESSORIES

- A. Trims and Flashings: Material, metal thickness, and finish to match panels. Profiles indicated in drawings.
  1. Provide manufacturer's standard accessories and other items essential to completeness of standing seam roof installation.
- B. Panel Penetration Flashings: As recommended by panel manufacturer; designed to provide sufficient movement to prevent creation of points of fixity at penetrations.
- C. Sealant for Field Application: (high grade curing or non-curing butyl, Polyether, Silicone, and curing urethane sealant as recommended by panel manufacturer. Do not use sealant containing asphalt). (See section "07 92 00" Joint Sealants.)

## 2.7 FABRICATION

- A. Fabrication, General:
  1. Unless otherwise shown on the drawings or specified herein, fabricate panels in continuous lengths and fabricate flashings and accessories in longest practical lengths.
  2. Panel materials shall be factory correctively-leveled.
- B. Panels:
  1. Provide panels in full length from ridge to eave. Traverse seams or "splices" are not recommended.
  2. Roof panels shall have flush horizontal and vertical surfaces to facilitate sealing at

terminations. Panel configurations which create voids and requiring supplemental closure devices shall be considered acceptable (foam closures).

3. Engineer panels to use concealed anchors that permit expansion and contraction away from the point of fixity ("PIN" point).
- C. Seams:
1. Panel seams shall "snap" and interlock entire length of seam.
  2. Design standing seam to lock up and resist joint disengagement during design wind uplift conditions as calculated according to local building codes.
- D. Fabrication Tolerances:
1. Flat metal surfaces will display waviness commonly referred to as "oil canning". This is caused by steel mill tolerances and is a characteristic, not a defect, of panels manufactured from light gauge metal. Panel materials are factory correctively-leveled to minimize the occurrence of "oil canning". As such, "oil canning" will not be accepted as cause for rejection.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions: With Installer present.
1. Examine conditions and substrates on which metal panels are to be installed. Structural support or substrate shall be flat and plumb to avoid panel stresses and distortion.
  2. Prior to starting work, correct defects.
- B. Field Measurements:
1. Coordinate field measurements and fabrication schedule with construction progress.
  2. Field measure prior to fabrication. Show recorded dimensions on shop drawings, including locations of shop-fabricated openings.
  3. If field measurements differ from drawing dimensions, notify Architect prior to fabrication.
- C. (Framing)(Substrate) Tolerances: Deviations from flat plane shall not exceed the following.
1. 1/4 inch in 20 feet.
  2. 1/2 inch across building elevation.
  3. 1/8 inch in 5 feet.

### **3.2 PREPARATION**

- A. (Secondary Framing)(Substrate and Underlayment): Install according to approved shop drawings and metal panel manufacturer's recommendations.

### 3.3 INSTALLATION

- A. Panels and Trim: Comply with manufacturer's instructions for assembly, installation and erection for weather tight installation.
  - 1. Install according to approved shop drawings.
  - 2. Install panels in accordance with manufacturer's instructions and recommendations. Anchor securely in place using clips and fasteners spaced in accordance with manufacturer's recommendations for design wind load criteria.
  - 3. Comply with methods and recommendations of SMACNA Architectural Sheet Metal Manual for flashing configurations required.
  - 4. Discrepancies between job site conditions and shop drawings shall be brought to the attention of the Architect for resolution.
  - 5. Cutting and Fitting:
    - a. Cut panels neat, square, and true with shearing action cutters. Torch or power saw cutting is prohibited.
    - b. Openings 6 inches and larger: Shop fabricate and reinforce to maintain original load capacity.
    - c. Openings less than 6 inches: Field cutting is acceptable.
  - 6. Dissimilar Metals or Materials:
    - a. Where panel or trim may come in contact with dissimilar metals or treated lumber, fabricate transition to facilitate drainage and minimize possibility of galvanic action. Galvanic action can cause panels and trim to fail prematurely.
    - b. At points of contact with dissimilar metal or treated lumber, coat panel and trim with protective paint or separate materials with a weatherproof underlayment.
    - c. Direct contact or run-off from CCA, ACQ, CA, or other treated lumber (outdoor wood) or fire retardant impregnated or treated wood shakes or siding can cause panels and trim to fail prematurely. Avoid contact with these materials.
- B. Accessories: Install trims, flashings, and roofing specialties according to Drawings and manufacturer's recommended details.
- C. Sealant Installation: Apply according to approved shop drawings and SMACNA Architectural Sheet Metal Manual recommendations.
  - 1. Provide airtight and waterproof installation.
- D. Installation Tolerances: [\(Match dimensional tolerances of framing or substrate.\)](#)
  - 1. Flatness: <Insert requirement.>

### 3.4 CLEANING

- A. Repairs:
  - 1. Touch up paint is not required for panels with scratches that do not expose base metal.
  - 2. Kynar 500® (PVDF- air dryable) touch up paint pens are recommended for minor scratches showing the substrate. Use minimal paint to fill scratch.
  - 3. Panels or flashings with finish damage exposing metal or with substrate damage shall be replaced.

- B. Cleaning and Waste Management:
  - 1. At completion of each day's work and at work completion, sweep panels, flashings, and gutters clean. Do not allow fasteners, cuttings, filings, or scraps to accumulate.
  - 2. Clean exposed surfaces of work promptly after completion of installation.

### **3.5 PROTECTION**

- A. Protect Work as required to ensure that roofing will be without damage at Final Completion.

**END OF SECTION**