



SECTION 07410 - METAL ROOF & WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary.

1.2 SUMMARY

- A. Section Includes: Metal Roof and Wall Panels.
- B. Related Sections:
 - 1. Division 5 Section: Metal Roof Deck.
 - 2. Division 6 Section: Rough Carpentry.
 - 3. Division 7 Section: Roofing.
 - 4. Division 7 Section: Roof Specialties and Accessories.
 - 5. Division 7 Section: Joint Sealers.
 - 6. Division 7 Section: Flashing and Sheet Metal.

1.3 PERFORMANCE REQUIREMENTS

- A. Water Penetration: No water penetration when tested according to ASTM E 1646-95 at the following test-pressure difference:
 - 1. Test – Pressure Difference: 12.0lb/sq. ft.
- B. FMG Listing: Provide metal roof panels and component materials that comply with requirements in FMG 4471 as part of a panel roofing system and that are listed in FMG's "Approval Guide" for class 1:
 - 1. Fire/Windstorm Classification: Class 1 A [60] [75] [90] [105] [120] <Insert number>
 - 2. Hail Resistance: [SH] [MH]
- C. Thermal Movement: Provide metal roof panel assemblies capable of thermal movements resulting from the following maximum change (+ or – 100 degrees F) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

- D. Solar Reflectance for roofs with Slopes of 2:12 or less. Initial solar reflectance of not less than 0.65 when tested according to ASTM E 903, and maintained, under normal conditions, solar reflectance of not less than 0.50 for 3 years after installation.
- E. Metal panel assembly shall be listed with Underwriters Laboratories as class A (or C) roof system with regards to their resistance to external flame sources.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A792 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
3. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus.
4. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
5. ASTM D523 Standard Test Method for Specular Gloss.
6. ASTM D822 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
7. ASTM D968 Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
8. ASTM D1005 Standard Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers.
9. ASTM D1308 Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
10. ASTM D2244 Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
11. ASTM D2247 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
12. ASTM D4214 Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
13. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
14. ASTM E283 Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
15. ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
16. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
17. ASTM E1592 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
18. ASTM E1646 Standard Test Method for Water Penetration of Exterior Metal Roof Systems by Uniform Static Air Pressure Difference.
19. ASTM E1680 Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems.
20. ASTM G23 Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) with and without Water for Exposure of Nonmetallic Materials.

B. Factory Mutual (FM):

1. FM 4471 Class 1 Panel Roofs.

- C. Underwriters Laboratories, Inc. (UL):
 - 1. UL 580 Tests for Uplift Resistance of Roof Assemblies.
- D. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA):
 - 1. Architectural Sheet Metal Manual.
- E. The National Roofing Contractors Association (NRCA):
 - 1. Roofing and Waterproofing Manual (including Construction Details), and Handbook of Accepted Roofing Knowledge.
- F. PMRS Inc.:
 - 1. Manufacturer's Construction Details Handbook.
- G. American Institute of Steel Construction (AISC):
 - 1. Steel Construction Manual.
- H. American Iron and Steel Institute (AISI):
 - 1. Cold Formed Steel Design Manual.

1.5 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit manufacturer's product data and installation instructions.
- C. Shop Drawings: Provide drawings as follows:
 - 1. Shop drawings are to be small-scale roof plans and elevations, indicating extent of work to be performed.
 - 2. Include sections of roof, fascia, walls, siding and soffits, for each condition, detailing flashing and trim for different conditions, such as eaves, outside and inside corners, ridges, valleys, gutters, end wall terminations, closures and similar conditions, showing a full and complete installation.
 - 3. Show securement of panels and clips, spacing, type and number of fasteners, as recommended by manufacturer.
- D. Samples: Submit selection samples as follows:
 - 1. 2' (610 mm) long sample panel indicating metal, gauge, color, texture and finish.
- E. Quality Assurance/Control Submittals: Submit the following:
 - 1. Test Reports: Submit test reports demonstrating compliance with finish requirements.
 - 2. Certificates: Submit manufacturer's certificate that products meet or exceed all specified requirements.

- F. Closeout Submittals: Submit the following:
 - 1. Warranty documents specified herein.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. An employer of workers trained and approved by manufacturer.
 - 2. Utilize an installer having demonstrated experience on projects of similar size and complexity.
 - 3. Installer's responsibilities include installation of metal roof panel assemblies and providing professional engineering services by metal roof manufacturer.
 - 4. Engineering Responsibilities: Preparation of data for metal roof panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer that has UL listed and FMG approval for roofing system identical to that used for this project.
 - 1. Manufacturer's Technical Representative Qualifications: An authorized full-time employee representative of manufacturer experienced in installation and maintenance of the specified roofing system and qualified to determine installer's compliance with the requirements of this project.
 - 2. Roof Inspections: A minimum of [**2 days per week**] and MUST provide daily reports directly to owner representative and architect and must be a full-time employee.
 - 3. Metal Roof panels MUST be fabricated by the Metal Roofing Manufacturer that is providing the specified warranty. These panels are to be formed and quality inspected by direct employees of the Metal Roofing Manufacturer while on-site.
 - 4. The Roofing Manufacturer's must show proof that the machine in use has been calibrated within the last [**6 months**]. Calibration of this machine will be in accordance with panel machine manufacturer.
- C. Source Limitations: Obtain each type of metal roof panels through one source from a single manufacturer.
- D. Regulatory Requirements and Approvals: [**Specify applicable requirements of regulatory agencies.**].
 - 1. [**Code agency name**].
 - a. [**Report or approval number**].
- E. Mock-Ups: Install approximately [**500 ft² (47 m²)**] of product in place for Architect's approval, before proceeding with substantial work. [**Specify additional requirements for mock-up.**].
 - 1. Subject to acceptance by owner, mock-up may be retained as part of finish work.

2. If mock-up is not retained, remove and properly dispose of mock-up.

F. Progress Meetings: Must attend all meetings while roof installation is in progress.

1.7 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirement Section.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Unload store, and erect metal roof panels in a manner to prevent bending,

D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1. Store materials above ground, on skids.

2. Protect material with waterproof covering and allow sufficient ventilation to prevent condensation buildup or moisture entrapment on the materials.

1.8 PROJECT CONDITIONS

A. Field dimensions shall be taken prior to fabrication to verify jobsite conditions.

B. Field Measurements: Verify locations of roof framing and roof opening dimensions by field measurements before metal roof panel fabrication and indicate measurements.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal roof panels without field measurements, or allow for field-trimming of panels. Coordinate roof construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify locations of roof framing and roof opening dimensions by field measurements before metal roof panel fabrication and indicate measurements on Shop drawings.

1. Establish Dimensions: Where field measurements cannot be made without delaying the work, either establish framing and opening dimensions and proceed with fabricating metal roof panels without field measurements, or allow for field trimming of panels. Coordinate roof construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

C. Coordinate metal panel roof assemblies with rain drainage work, flashing, trim, and construction of [decks] [purlins and rafters,] parapets, walls, and other adjoining work to provide a leak proof, secure and non-corrosive installation.

1.10 COORDINATION

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations, which are specified in Division 7 Section "Roof Accessories."
- B. Roof installer must supply and install roof accessories that are approved by the roofing manufacturer, and according to the manufacturer's recommended details.

1.11 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents. Provide warranties as follows:
 - 1. Warranty covering the metal substrate against rupture, perforation and structural failure due to normal atmospheric corrosion.
 - 2. Warranty on paint finish against cracking, peeling, blistering, chalk and color change.
 - 3. Substrate Warranty Period: [25] years beginning with date of substantial completion.
 - 4. Finish Warranty Period: [30 years for Standard Colors] [20 years for Metallic and Exotic finishes].

PART 2 - PRODUCTS

2.1 METAL ROOF AND WALL PANEL SYSTEMS

- A. Manufacturer: PMRS Inc.
 - 1. Contact: Chattanooga, TN 423-634-5056
 - 2. Website: premiummetalroof.com
- B. Proprietary Products/Systems: Metal roof and wall panels, including the following:
 - 1. PMS 150 SL Architectural Snap-Lock Standing Seam:
 - a. PMS 150 Integral Snap-Lock, [**Specify width 12" - 22 3/4" (305 - 578 mm).**], 1 1/2" (38 mm) high, [**With ribs**] [**Without ribs**].
 - b. Wind Uplift Resistance (UL 580): Class 90.
 - c. Wind Uplift Resistance (ASTM E330): [**Specify wind uplift performance.**].
 - d. Air Infiltration (ASTM E283): [**Specify allowable infiltration.**].
 - e. Water Penetration (ASTM E331): [**Specify allowable penetration.**].
 - f. Surface Burning Characteristics, Coating and Substrate, Steel/PVDF only (ASTM E84): 25 or less (Class A).
 - g. Minimum Allowable Slope: 3:12.
 - h. Installation Method: Solid deck or open purlins.
 - .
 - 2. PMS 175 SL Structural Architectural Snap-Lock Standing Seam:

- a. PMS 175 Integral Snap-Lock, [**Specify width 12" - 18" (305 - 457 mm)**], 1 3/4" (45 mm) high, [**With ribs**] [**Without ribs**].
 - b. Wind Uplift Resistance (UL 580): Class 90.
 - c. Air Infiltration (ASTM E1680, ASTM E283): [**Specify allowable infiltration.**].
 - d. Water Penetration (ASTM E1646, ASTM E331): [**Specify allowable penetration.**].
 - e. Wind Uplift Resistance (ASTM E1592): [**Specify wind uplift performance.**].
 - f. Wind Uplift Resistance (ASTM E330): [**Specify wind uplift performance.**].
 - g. Surface Burning Characteristics, Coating and Substrate, Steel/PVDF only (ASTM E84): 25 or less (Class A).
 - h. Installation Method: Solid deck or open purlins.
 - i. Minimum Allowable Slope: 3:12.
3. PMS 150 MS Architectural Mechanically Locked Standing Seam:
- a. PMS 150 Mechanically Seamed, [**12" (305 mm) to 24" (610 mm)**] wide, [**90**] [**180**] degree seam, 1 1/2" (38 mm) high, [**With ribs**] [**Without ribs**].
 - b. Wind Uplift Resistance (UL 580): Class 90.
 - c. Air Infiltration (ASTM E1680): [**Specify allowable infiltration.**].
 - d. Water Penetration (ASTM E1646): [**Specify allowable penetration.**].
 - e. Wind Uplift Resistance (ASTM E1592): [**Specify wind uplift performance.**].
 - f. Surface Burning Characteristics, Coating and Substrate, Steel/PVDF only (ASTM E84): 25 or less (Class A).
 - g. Installation Method: Solid deck.
 - h. Minimum Allowable Slope: 1/2:12.
4. PMS 200 MS Structural Architectural Mechanically Locked Standing Seam:
- a. PMS 200 Mechanically Seamed, [**Specify width 12" - 24" (305 - 610 mm)**], 2" (51 mm) high, [**With ribs**] [**Without ribs**], [**90**] [**180**] degree seam.
 - b. Wind Uplift Resistance (UL 580): Class 90.
 - c. Air Infiltration (ASTM E1680, ASTM E283): [**Specify allowable infiltration.**].
 - d. Water Penetration (ASTM E1646, ASTM E331): [**Specify allowable penetration.**].
 - e. Wind Uplift Resistance (ASTM E1592): [**Specify wind uplift performance.**].
 - f. Surface Burning Characteristics, Coating and Substrate, Steel/PVDF only (ASTM E84): 25 or less (Class A).
 - g. Installation Method: Solid deck or open framing.
 - h. Minimum Allowable Slope: 1/2:12.
5. PMS 400 Wall Panel and Soffit System:
- a. PMS 400 Flush Panel, [**12" (305 mm)**] [**14" (356 mm)**] [**18" (457 mm)**] wide, 1 1/2" (38 mm) deep, [**With ribs**] [**Without ribs**] [**With perforations**] [**Without perforations**].
 - b. Surface Burning Characteristics, Coating and Substrate, Steel/PVDF only (ASTM E84): 25 or less (Class A).
 - c. Installation Method: Solid deck or open framing.
 - d. Minimum Allowable Slope: Fascia, soffit or screen wall only.

2.2 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted.

2.3 MATERIALS

- A. Provide substrate materials as indicated below:
1. [Steel, with baked-on finish. {Kynar 500} {Hylar 5000} siliconized modified polyester].
 - a. [26 gauge Galvalume (ASTM A792), AZ50, 50 ksi yield, 52 ksi tensile].
 - b. [24 gauge Galvalume (ASTM A792), AZ50, 50 ksi yield, 52 ksi tensile].
 - c. [22 gauge Galvalume (ASTM A792), AZ50, 50 ksi yield, 52 ksi tensile].
 - d. [26 gauge G90 Galvanized (ASTM A653), 50 ksi yield, 52 ksi tensile].
 - e. [24 gauge G90 Galvanized (ASTM A653), 50 ksi yield, 52 ksi tensile].
 - f. [22 gauge G90 Galvanized (ASTM A653), 50 ksi yield, 52 ksi tensile].
 2. [Steel, bare, with high performance clear organic coating].
 - a. [26 gauge Galvalume (ASTM A792), AZ55, 50 ksi yield, 52 ksi tensile].
 - b. [24 gauge Galvalume (ASTM A792), AZ55, 50 ksi yield, 52 ksi tensile].
 - c. [22 gauge Galvalume (ASTM A792), AZ55, 50 ksi yield, 52 ksi tensile].
 3. [Aluminum, with baked-on finish. {Kynar 500} {Hylar 5000} siliconized modified polyester].
 - a. [0.032" (0.81 mm) thick aluminum (ASTM B209), alloy 3105-H14, coil and sheets].
 - b. [0.040" (1.02 mm) thick aluminum (ASTM B209), alloy 3105-H14, coil and sheets].
 - c. [0.050" (1.27 mm) thick aluminum (ASTM B209), alloy 3105-H14, coil and sheets].
 4. [Copper, bare, with no coating].
 - a. [16 oz (0.454 kg) copper, {1/2 hard} {3/4 hard}].
 - b. [20 oz (0.567 kg) copper, {1/2 hard} {3/4 hard}].

2.4 ACCESSORIES

- A. Provide components required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels, unless otherwise indicated.
1. Roofing Felt:
 - a. Type: 30 lb.
 - b. Manufacturer: Acceptable to metal panel manufacturer.
 2. Underlayment:
 - a. Type: Acceptable to metal panel manufacturer.
 - b. Manufacturer: Acceptable to metal panel manufacturer.
 - c. [Membrane: 60 Mil self-adhered elastomeric under entire metal roof area as indicated on architectural drawings.]
 - d. Polyglass: POLYSTICK MTS High Temperature [resistant to 265 degrees F]
 3. Solder:
 - a. Type: Acceptable to metal panel manufacturer.
 - b. Manufacturer: Acceptable to metal panel manufacturer.
 4. Clips, Closures, and Fasteners:

- a. 1 piece: 18 gauge stainless steel UL90 rated clip, 3" long.
 - b. 1 piece: 18 gauge galvanized steel clip, 3" long.
 - c. Manufacturer: Acceptable to metal panel manufacturer.
5. Flashing and Trim:
- a. All flashing and trim shall be of the same material, gauge, finish, and color as the roof panels and fabricated in accordance with standard SMACNA procedure and details.
 - b. Manufacturer: Acceptable to metal panel manufacturer.
6. Gutters:
- a. Fabricate gutters in the same gauge, material, finish, and color as the roof panels. [**7" (178 mm) box gutter**] [**Acceptable to metal panel manufacturer**].
 - b. Manufacturer: Acceptable to metal panel manufacturer.
7. Downspouts:
- a. Fabricate downspouts in the same gauge, material, finish, and color as the roof panels.
 - b. Manufacturer: Acceptable to metal panel manufacturer.
8. Roof Curbs:
- a. Type: Acceptable to metal panel manufacturer.
 - b. Manufacturer: Acceptable to metal panel manufacturer.
9. Leaf Guard:
- a. Type: Acceptable to metal panel manufacturer.
 - b. Manufacturer: Acceptable to metal panel manufacturer.

2.5 FABRICATION

A. Panel Construction:

1. Panels shall be uniformly dimensioned, roll formed to exact lengths to avoid trimming.
2. Panels shall be continuous from ridge to eaves with no end laps with no face penetration of panels, except as indicated and for securing panels to facilitate directional expansion/contraction.
3. The Roofing Manufacturer's must show proof that the machine in use has been calibrated within the last 6 months. Calibration of this machine will be in accordance with panel machine manufacturer.
4. Roofing Manufacturer must provide [**a minimum of two days per week**] of Technical Service. The technical service employee must be employed full-time by the Roofing Manufacturer.
5. Panels will be brought directly to job-site, either by portable roll forming or delivery.

B. Prior to roof installation: Panel machine must be calibrated in accordance with panel machine manufacturer.

C. Flashing and Trim:

1. Furnish all exposed standard or special flashing/trim and such other material break formed in the same gauge, color and finish to match roofing panels.
2. Furnished materials with protective strippable film to be removed upon installation.

3. Furnish accessories such as clips, closures, fasteners, etc., shall be as recommended by manufacturer.

2.6 FINISHES

A. Factory Priming and Finishing:

1. **[Permacolor 2000 Finish] [Metallic Copper] [Preweathered Galvalume]**: Standard color coating comprised of a 0.8 - 0.9 mil full strength, 70% Kynar 500/Hylar 5000 fluorocarbon (Polyvinylidene Fluoride PVF2) coating over urethane primer of 0.2 - 0.3 mil on finish side, **[On steel, primer and wash coat on reverse] [On aluminum wash coat only]**. Face film thickness: 1.0 mil + 0.2 mil.
 - a. Film Thickness Topside Finish (ASTM D1005): Primer 0.2 - 0.3 mil Kynar 500 top coat 0.8 - 0.9 mil. Reverse side finish 0.2 - 0.3 mil primer with a wash coat. Total dry film thickness for the coating system 1.0 mil nominal.
 - b. Specular Gloss (ASTM D523): 35% + 5 reflectance specular at a glossmeter angle of 60 degrees.
 - c. Humidity Resistance (ASTM D2247): No blistering, cracking, peeling, loss of gloss or softening of finish after **[3000 hours aluminum] [1000 hours coated steel]** of exposure at 100% humidity at 95 degrees F (35 degrees C).
 - d. Salt Spray Resistance (ASTM B117): Samples diagonally scored and subjected to 5% - at 95 degrees F (35 degrees C), neutral salt spray, then taped with Scotch #610 cellophane tape: **[3000 hours aluminum] [1000 hours coated steel]** no blistering and no loss of adhesion greater than 1/8 from score line.
 - e. Chemical Resistance (ASTM D1308): No effect after 24 hour exposure of a 10% solution of hydrochloric acid and 18 hour exposure to 20% sulfuric acid including exposure to 10% muriatic acid and nitric acid fumes.
 - f. Chalking Resistance (ASTM D659): No chalking greater than #8 rating test procedure after a 3000 hour weatherometer test.
 - g. Color Change (ASTM D822, ASTM G23, ASTM D2244 South Florida 10 years): Finish coat color change shall not exceed 5 NBS units after 3000 hour weatherometer test.
 - h. Abrasion Resistance (ASTM D968): Shall pass 60 liters/mil, minimum of falling sand, Method A.
 - i. Physical properties: the coating shall conform to the manufacturer
2. Galvalume Plus:
 - a. High performance clear organic coating applied over Galvalume.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Comply with the instructions and recommendations of the metal roof and wall panel manufacturer.
- B. Prior to roof installation: Panel machine must be calibrated in accordance with panel machine manufacturer.
- C.

3.2 EXAMINATION

A. Site Verification of Conditions:

1. Verify that site conditions are acceptable for installation of the metal roof and wall panel system.
 - a. Verify substrate is uniform, even and symmetrical by running a string test.
 - b. Inspect to ensure that all purlins or other substructure and framing members are flat and insulation is embedded symmetrically so when the metal panels are applied, they will not appear wavy or distorted.
2. Do not proceed with installation of the metal roof and wall panel system until unacceptable conditions are corrected.
3. Technical Service Days: Must be able to provide a full-time technical service representative for inspections.

3.3 PREPARATION

A. Protection:

1. Do not proceed with metal panel installation until adjoining areas scheduled for stucco treatment have been stuccoed and washed down.
2. Do not wash down acid residues from stucco directly over the metal panels.

3.4 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment and building-paper slip sheet on roof sheathing under metal roof panels, unless otherwise recommended by metal roof panel manufacturer. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under metal roof panels. Apply at locations indicated [**below**] [**on drawings**], in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).
1. Apply from eave to ridge.
 2. Apply on roof not covered by self – adhering sheet underlayment. Lap edges of self adhering sheet underlayment not less than 3 inches (75 mm), in shingle fashion to shed water.
- B. Self – Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under metal roof panels. Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply [**over entire roof**] [**at locations indicated below**] [**at locations indicated on drawings**], in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). [**Extend underlayment into gutter trough.**] Roll laps with roller. Cover underlayment within 14 days.
1. Roof perimeter for a distance up from eaves of [**24 inches (600 mm)**] [**36 inches (900 mm)**] < **Insert Dimension** > beyond interior wall line.
 2. Valleys, from lowest point to highest point, for distance on each side of [**18 inches (460 mm)**] < **Insert Dimention** >. Overlap ends of sheets not less than 6 inches (150 mm).
 3. Rake edges for a distance of [**18 inches (460 mm)**] < **Insert dimensions** >.
 4. Hips and ridges for a distance on each side of [**12 inches (300 mm)**] < **insert dimension** >.

5. Roof to wall intersections for a distance from wall of [**18 inches (460 mm)**] <Insert dimension>.
 6. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of [**18 inches (460 mm)**] <Insert dimension>.
- C. Install flashings to cover underlayment to comply with requirements specified in Division 7 Section “Sheet Metal Flashing and Trim.”
- D. Apply slip sheet over underlayment before installing metal roof panels.

3.5 INSTALLATION

- A. General: Comply with the following:
1. SMACNA Architectural Sheet Metal Manual.
 2. NRCA Roofing and Waterproofing Manual and Handbook of Accepted Roofing Knowledge.
 3. Manufacturer's Construction Details Handbook.
 4. AISC Steel Construction Manual.
 5. AISI Cold Formed Steel Design Manual.
- B. Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Field cutting of metal roof panels by torch is not permitted.
 2. Install panels perpendicular to purlins.
 3. Rigidly fasten eave and end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Pre-drill panels.
 4. Provide metal closures at [**peaks**] [**rake edges**] [**rake wall**] [**and**] each side of ridge [**and hip**] caps.
 5. Flash and seal metal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 6. Install ridge [**and hip**] caps as metal roof panel work proceeds.
- C. Install metal panel system plumb, level and straight [**Over a layer of 30 lb felt, (dry)**] with a minimum 6" (152 mm) horizontal lap and 12" (305 mm) end lap.
- D. Install [**Standing**] [**Batten**] seam equidistant and aligned for corners, hips, valleys, mullions and columns in accordance with architectural design parameters indicated on drawings.
- E. Install panel system in accordance with approved shop drawings.
- F. Make no face penetrations or perforations in metal panels by fasteners except as indicated or with specific approval by Architect.
- G. Install all panels continuous from ridge to eaves with no horizontal end laps.
- H. End lap all flashing and trim at least 3" (76 mm).
- I. Miter and solder all gutters and seal with a lining of ice and water shield membrane applied at the laps to provide watertight condition.
1. Apply sealant at all butt joints.
 2. Counter-flash or paint to match all soldered areas.

- J. Treat all valleys with a layer of ice and water shield spread out at least 24" (610 mm) each side from the center of the valley, on both sides, before applying valley flashing.
- K. End lap at least 6" (152 mm) at joints.
- L. Use manufacturer's standard corrosion resistant steel fasteners for surfaces exposed to the interior.
- M. Exercise care during installation to avoid damage or scratching of the panels.
 - 1. Avoid walking on metal roof panels after installation is completed.

3.6 THERMAL INSULATION INSTALLATION FOR FIELD-ASSEMBLED METAL ROOF PANELS

- A. Board Insulation: Extend insulation in thickness indicated to cover entire roof. Comply with installation requirements in Division 7 Section " Building Insulation."
- B. Blanket Insulation: Install insulation concurrently with metal roof panel installation, in thickness indicated to cover entire roof, according to manufacturer's written instructions and as follows:
 - 1. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for fire stopping.
 - 2. Tape joints and ruptures in vapor retarder and seal each continuous area of installation to surrounding construction to ensure airtight installation.
 - 3. Install factory-laminated, vapor retarder-faced blankets straight and true in one-piece lengths with both sets of facing tabs sealed to provide a complete vapor retarder. Comply with the following installation method:
 - 4. Install blankets straight and true in one piece lengths. Comply with the following installation method:
 - a. Over-Framing: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Hold in place by panels fastened to secondary framing.
 - b. Between-Purlin Installation: Extend Insulation and vapor retarder between purlins. Carry vapor-retarder facing tabs up and over purlin, overlapping adjoining facing of next insulation course maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.
 - c. Over-Purlin-with-spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to flange of secondary framing members. Install layer of filler insulation over first layer to fill space formed by roof panel standoffs. Hold in place by panels fastened to standoffs.
 - d. Two-layers-between-Purlin- with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder facing tabs up and over purlins, overlapping adjoining facing of next insulation course maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
 - 5. Retainer strips: Install retainer strips at each longitudinal insulation joint straight and taut, nesting with secondary framing to hold insulation in place.
 - 6. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect completed metal roof panel installation, including accessories.

B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.

3.8 CLEANING

A. Peel off any strippable film on flashing components as they are installed.

B. Touch up all minor scratches and spots.

C. Remove and legally dispose of all debris resulting from work under this Section.

3.9 PROTECTION

A. Protect installed work from damage due to subsequent construction activity on the site.

3.10 FINAL INSPECTION

A. Final inspection will be performed by a representative of metal roof manufacturer and building owner. Building owner can designate a firm to be present during final inspection, but will be paid by building owner.

END OF SECTION