SECTION 07 41 10
PREFORMED METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory preformed steel structural standing seam panel system with separate mechanically seamed “T” cap with factory applied sealant.

B. Thermal Insulation, Cover Board, and Underlayment

C. Fastening system.

D. Accessories and miscellaneous components.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry.

B. Section 07 62 00 - Sheet Metal Flashing and Trim.

C. Section 07 92 00 - Joint Sealants: Field-installed sealants.

1.03 REFERENCE STANDARDS

A. AISI - American Iron and Steel Institute.

B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; current edition.

C. ASTM A 240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; current edition.

E. ASTM A 875 - Standard Specification for Steel Sheet, Zinc-5 % Aluminum Alloy-Coated by the Hot-Dip Process.

F. ASTM D 1970 - Standard Test Method for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; current edition.

G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; current edition.

H. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; current edition.

I. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; current edition

J. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems

K. FM DS 1-28 - Wind Loads to Roof Systems and Roof Deck Securement; Factory Mutual Insurance Company, current edition.

L. FM 4470 Approval Standard for Class 1 Panel Roofs.

M. FM 4471 - Class 1 Panel Roof; Factory Mutual Research Corporation.

N. FM DS 1-29 - Loss Prevention Data 1-29, Roof Deck Securement and Above Deck Roof Components , current edition.

O. FM DS 1-31 - Loss Prevention Data 1-31, Metal Roofing Systems, current edition.

P. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

Q. SMACNA (ASMM) - Architectural Sheet Metal Manual; current edition.

R. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies, current edition.

S. UL 790 - Standard Test Methods for Fire Tests of Roof Coverings.

1.04 GENERAL REQUIREMENTS

A. Provide metal roof panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency. Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction. Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated The roofing system shall be provided by the Contractor as a complete system; roof panels, components, transitions, accessories, and assemblies shall be supplied by the same roofing system manufacturer. Panels shall be a factory preformed steel structural standing seam panel system with separate mechanically seamed batten “T” cap which are designed to span the distance between supports and to resist wind uplift pressures.. Roof panel anchor clips shall be concealed and designed to allow for longitudinal thermal movement of the panels, except where specific fixed points. Panels to have a “fixed” ridge with a “floating” eave. Provide for lateral thermal movement in panel configuration or with clip designed for lateral and longitudinal movement.
   1. Provide a hydrostatic standing seam roof system that is factory formed, prefinished, mechanically field-seamed with integral sealant, concealed clip, standing seam panel system with separate mechanically seamed batten “T” cap roof system which has been pretested and certified by manufacturer to comply with specified requirements under installed conditions.
   2. There shall be no exposed or penetrating fasteners except where shown on approved shop drawings. Panels shall be continuous lengths, with no joints or seams, except where indicated or specified. Ribs of adjoining sheets shall be continuous contact from eave to ridge.
   3. Field-formed seam type systems shall be mechanically locked closed by the manufacturer’s locking tool. The seam shall include a continuous factory applied sealant.

1.05 DESIGN REQUIREMENTS

A. Wind Uplift Resistance and Load Capacity:
   1. Wind Load: Provide roofing assemblies, including anchorage, capable of withstanding wind pressures acting inward and outward normal to the plane of the roof. The complete roof system assembly shall be rated and installed to resist wind loads calculated in accordance with ASCE 7, ICC IBC Building Code, and Local Code whichever is more resistive to wind load requirements and validated by uplift resistance testing in accordance with Factory Mutual (FM) test procedures. Base wind uplift measurements on an ultimate design wind speed in accordance with ASCE 7, reference drawings.
   2. The roof assembly shall be designed in accordance with UL 580 and system shall be ASTM 1592 tested and approved to resist the indicated loads. Submit test report, as supplied by the roofing manufacturer, for negative wind uplift pressures no less than that specified for the roof system over the application substrates.
   3. Reference Drawings for structural design loads as well as 2021 IBC and ASCE 7-16.

B. Fire-Test-Response Characteristics:
   1. Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspection agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
   2. FMG Listing: Provide roofing and component materials that comply with requirements in FMG 4470 and FMG 4471 as part of a roofing system and that are listed in FMG's "Approval Guide" for Class 1 or non-combustible construction, as applicable. Identify materials with FMG markings.
   3. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part. System to have a Class A rating.

C. Thermal Expansion and Contraction

1. Completed metal roofing and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, or reducing performance ability.
2. The design temperature differential shall be not less than 200 degrees Fahrenheit.
3. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.

D. Static air pressure water infiltration: The panel system shall be tested in accordance with ASTM E1646, and meet or exceed the following performance requirements:
1. Pressure – Result: 6.2 Gal/Hr per S.F. and Static Air Pressure of 20.0 psf for 15 minutes - No Leakage.

E. Static water pressure head water infiltration:
1. The panel system shall be tested in accordance with ASTM E2140, and pass with no leakage. The test specimen must include a panel end lap condition and successfully withstand being submerged under 6” of water for 6 hours.
2. The panel system shall be tested in accordance with the FBC TAS 114 Appendix G, and pass with no leakage. The test specimen must successfully withstand being submerged under 6” of water for 168 hours.

F. Dynamic pressure water penetration:
1. The panel system shall be tested in accordance with AAMA 501.1, and pass with no water penetration, other than condensation, when exposed to 8” per hour of dynamic rain and 70 mph wind velocities for not less than five (5) minutes duration.
2. The panel system shall be tested in accordance with FBC TAS 100, and pass with no water penetration, other than condensation, when exposed to 8.8” per hour of dynamic rain and 110 mph wind velocities for not less than five (5) minutes duration.

G. Air infiltration: The panel system shall be tested in accordance with ASTM E1680, and meet or exceed the following performance requirements:
1. Pressure - Area Leakage Rate
   a. 1.57 PSF - 0.0030 cfm/sq.ft.
   b. 6.24 PSF - 0.0045 cfm/sq.ft.
   c. 20.0 PSF - 0.0060 cfm/sq.ft.

1.06 SUBMITTALS

A. Product Data: Manufacturer's specifications, standard profile sheet and data sheets on each product to be used, including:
1. Summary of test results, indicating compliance with specified requirements.
2. Storage and handling requirements and recommendations.
3. Installation methods including attachment of fastening patterns/spacing and fasteners.
4. Specimen warranty.

B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, and special conditions.
1. Show work to be field-fabricated or field-assembled.

C. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
1. Include typical panel joint in sample.
2. Include typical fastening detail.

E. Test Reports: Indicate compliance of preformed metal roofing system to specified requirements.
1. Provide Factory Mutual assembly number for roofing system.
2. Provide clip attachment pattern meeting wind uplift requirements shown on drawings and indicated in the specification.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience. Manufacturer shall have in place a documented, standardized quality control program such as ISO-9001 approval.

B. Manufacturer's Technical Representative: The manufacturer's technical representative shall provide inspections during the installation of the roof system. This representative shall be thoroughly familiar with the products to be installed, installation requirements and practices, and with all special considerations required in the geographical area where construction will take place. The representative shall perform field inspections and provide written reports of inspections. The manufacture-authorized service representative shall inspect metal roof panel installation, including accessories at the start of installation (within the first 20 squares), midpoint of installation, and final installation, at a minimum.

C. Installer Qualifications: The metal roof system installer shall either be approved, authorized, or licensed, in writing by the roof system manufacturer, to install twenty (20yr) year no-dollar-limit warranty roof systems as specified with a minimum of five (5) experience in the installation of “T” standing seam metal roof systems.

D. Perform work in accordance with SMACNA Architectural Sheet Metal Manual, NRCA and MBMA requirements along with standard details, as well as the roofing manufacturer's written instructions.

E. Preliminary Roofing Conference: Before starting work, conduct conference at Project site. Review methods and procedures related to roof removal and installation of metal roof panels including, but not limited to, the following:
   1. Meet with Owner, Contractor, Architect, metal roof panel manufacturer's representative and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal roof panel installation, including manufacturer's written instructions.
   4. Removal of existing system. Examine substrate conditions for soundness and compliance with requirements, including flatness and attachment of substrate.
   5. Review structural loading limitations during and after roofing.
   6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
   7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
   8. Review temporary protection requirements for metal roof panels during and after installation.
   9. Review roof observation and repair procedures after metal roof panel installation.
   10. Review stored material and access requirements for executing the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Provide strippable plastic protection on prefinished roofing panels for removal just prior to installation.

B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

C. 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.

1.09 WARRANTY

A. Material Warranty: The Contractor shall warrant that the materials and accessories furnished in accordance with these specifications shall remain free from defects in material and workmanship for a period of five (5) years from date of Substantial Completion.

B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels, fascia, soffit, trim and exposed metal accessories, agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 20 year period from date of Substantial Completion.
   1. Exposed Panels Finish - deterioration includes the following:
      a. Color fading more than 5 hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling or failure of paint to adhere to a bare metal.

C. Weathertight Warranty: Manufacturer shall provide weathertight warranty against water penetration of the metal roof panel system, including roof panels, roof curbs, roof flashing, panel side joint and trim conditions, securement of components and assemblies and roof flashings, penetration flashings, mastic, closures, and sealants as provided by the manufacturer for a period of 20 years from date of substantial completion. Coverage shall be limited to material and installation. Manufacturer will also provide endorsements for underlayments, cover board and insulation boards. The manufacturer's limit of liability shall be NO DOLLAR LIMIT.
   1. Warranty Period: 20-year (from date of Substantial Completion) manufacturer's standard warranty of labor and materials for water-tightness of the roofing system.
   2. Warranty shall include roofing damage resulting from wind speeds up to 75 mph (3-second gust speed at 33 feet above ground for exposure category indicated).
   3. The maximum amount of the system warranty shall not be prorated over the life of the warranty.

D. Special Warranty: Provide 5-year extended labor warranty on any soffit that becomes loose or damaged by wind uplift.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Design is based on: IMETCO Company Inc, Series 300 (S300), T-Seam panel system

B. Substitutions: Product Requirements. Materials, accessories, and testing specified shall establish the minimum level of quality, performance, dimension, and appearance required of any substitution.

C. Performance Requirements: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

D. Assembly shall include roof panels, clips, fasteners, connectors, bearing plates and miscellaneous accessories required for a complete installation.

2.02 STANDING SEAM STRUCTURAL ROOF PANELS

A. Performance Requirements: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Assembly shall include roof panels, clips, fasteners, connectors, bearing plates, end closures and miscellaneous accessories required for a complete installation tested for conformance to specified requirements.

C. Metal Roofing: Factory-formed panels with factory-applied finish.
   1. Steel Panels:
      a. Zinc-coated steel; minimum AISI-G90 galvanizing, smooth as per ASTM A 653.

b. Steel Thickness: Minimum 24 gauge.
2. Profile: T-Seam panel with standing seam of 2-3/8 inch tall mechanically seamed with factory installed sealant in-seam cap.
3. Texture: Smooth, with two longitudinal stiffening striations equally spaced.
4. Length: Full length of roof slope, without lapped horizontal joints.
5. Width: Maximum panel coverage of 18 inches.

2.03 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

B. Anchor Clips: Concealed Standard Anchor Clips: Clips 16 gauge galvanized steel, 1 piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.

C. Fasteners:
1. Concealed fasteners: Corrosion resistant steel fasteners (stainless steel or equal) designed to meet structural loading requirements.
2. Exposed fasteners: Series 410 stainless steel fasteners or 1/8 inch diameter stainless steel waterproof rivets. All exposed fasteners shall be factory painted to match the color of the standing seam panels.

2.04 PANEL FINISH

A. Fluoropolymer Coating System:
1. Exposed surfaces for coated panels: Two coat coil applied, baked-on full-strength (70% resin) fluorocarbon coating system (polyvinylidene fluoride, PVF2), applied by manufacturer's approved applicator.
2. Coating system shall have a minimum nominal dry film thickness of 1.0 mil, consisting of primer and color coat.
3. Unexposed surfaces for coated panels shall be baked-on polyester coating with .20 to .30 dry film thickness (TDF).

2.05 ACCESSORIES AND MISCELLANEOUS ITEMS

A. Provide all components required per the Drawings and the metal roof system manufacturer's approved shop drawings for a complete metal roof system to include panels, panel clips, bearing plates, trim/flashings, fascias, ridge, closures, sealants, fillers, panel end closures and any other required items.

B. Seam cap: Provide factory formed seam end snap-on cap shall be a minimum of 1" wide "T" shaped of continuous length up to 45 feet according to job conditions and field seamed by means of manufacturer's standard seaming machine. Cap shall be designed to receive two (2) beads of continuous hot applied gasketing sealant during manufacturing which will not encounter the anchor clips.

C. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, closure strips, and caps, of the same material, thickness, and finish as used for the roofing panels.

D. Closures: Factory precut closed cell foam meeting ASTM D 1056 or ASTM D 3575, enclosed in metal channel matching panels when used at hip, ridge, rake, and jamb.

E. Sealants: Elastomeric type containing no oil or asphalt.
1. Exposed sealant must cure to rubber-like consistency.
2. Concealed sealant must be non-hardening type.
3. Seam sealant must be factory-applied, non-skinning, non-drying type.
4. Flashing and Trim: Formed from 0.024-inch- thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges,

fasciae, and fillers. Finish flashing and trim with same finish coating system and finish warranty as adjacent metal roof panels.

F. Soffit: Metal Roofing Manufacturer supplied, aluminum soffit which is “vee” groove and non-vented profile. Finish soffit and trim with same finish coating system and finish warranty as adjacent metal roof panels. Design is based on: IMETCO Company Inc, SP Series, SP-120

G. Polyisocyanurate Roof Insulation: Where indicated on drawings, provide insulation as manufactured by the roofing manufacturer, standard panels composed of a rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents complying with ASTM C 1289, classified by facer type as follows:
1. Foam insulation shall comply with Factory Mutual Standard 4450 or UL.
2. Facer Type: Type II, Class 1, Grade 2, glass-fiber mat on both major surfaces.
3. The insulation shall be two layers of 2 inches; to provide for a total thickness of 4 inches for a minimum R-value of 22 (LTTR value).

H. Fiberglass Mat Faced Gypsum Cover Board: Where indicated on drawings, provide a water resistant gypsum core panels with glass mat facings embedded front and back, conforming to ASTM C 1177/C1177M, 0 Flame Spread and 0 Smoke developed when tested in accordance with ASTM E 84, 500 psi, Class A, non-combustible, 1/2 inch thick, acceptable to roofing manufacturer.

I. Underlayments:
1. Field, Eave, Ridge and Valley of the Roof Protection Membrane (ice and water shield): Self-adhering polymer-modified asphalt sheet as design to be installed under metal roof panels and approved by metal roofing panel manufacturer for application.

J. Gutters and Downspouts:
1. Gutters: Formed from 0.024-inch- thick, zinc-coated (galvanized) steel sheet prepainted with coil coating. Fabricate in minimum 96-inch- long sections, sized according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced 36 inches o.c., fabricated from same metal as gutters. Finish gutters to match roof fascia and rake trim. Provide profile as indicated on drawings.
2. Downspouts: Formed from 0.024-inch- thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; in 10-foot-long sections, complete with formed elbows and offsets. Finish downspouts to match gutters. Provide profile as indicated on drawings.
3. Coating: Gutter and Downspouts are to have the same finish coating and finish warranty as the metal panels.

K. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
2. Provide exposed fasteners with heads matching color of panel by means of plastic caps or factory-applied coating.
3. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels.
4. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.

L. Fasteners: Factory-coated steel fasteners and metal plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
1. Length as required for penetration of substrate.

M. Pipe flashings shall be pre-molded EPDM rubber with metal collar as provided by the metal roofing manufacturer.

N. Bearing Plate: Provide galvanized bearing plate, size and thickness as required by roofing manufacturer for application o roofing system.

O. Snow guards shall be as ColorGuard manufactured by S-5! Snow Retention System: Compatible with Garland's R-Mer Shield and R-Mer Span and R-Mer Loc metal panel systems. Snow guards to include all accessories, including but not limited to color strip, clamps, clips, splaces snow/ice clips, rail, etc.

2.06 FABRICATION

A. Panels: Fabricate panels and accessory items at factory, using manufacturer’s standard processes as required to achieve specified appearance and performance requirements. Panning of panel ends is required at ridge, hip and headwall conditions.

B. Joints: Factory-install captive gaskets, sealants, or separator strips at panel joints to provide weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

C. Material shall be in-line leveled prior to roll forming the panel profile.

D. Where possible, roll form panels in continuous lengths, full length of detailed runs.

E. Panel length shall be one length, not exceeding manufacturer’s allowable lengths.

F. Fabricate trim/flashing and accessories to detailed profiles.

G. Fabricate trim/flashing from same material as panel.

PART 3 EXECUTION

3.01 APPLICATION OF ROOFING – GENERAL

A. Install standing seam metal roofing system according to roofing system manufacturer's written instructions, and applicable recommendations of NRCA Roofing and Waterproofing Manual Design Manual.

B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.

C. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

D. Separate dissimilar metals and/or corrosive material by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

3.02 EXAMINATION

A. Inspection:
   1. The installer shall examine the building to verify that the structure is ready for roofing installation.
   2. Field-check dimensions and check support alignment with a fault string or wire. Support misalignment will cause panel "oil-canning."
   3. Verify substrate conditions are acceptable for product installation. Deck deflections which show up after panels are installed may require removal and replacement. Roof deck and roof panels shall be true and on plane
   4. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation
   5. Do not proceed until unsatisfactory conditions are corrected.

3.03 PREPARATION

A. Coordinate roofing work with provisions for roof drainage, and installation of flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

B. Remove protective film from surface of roof panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.

C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

D. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.04 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement and to meeting wind uplift requirements.
   1. Install roofing system with concealed clips and fasteners, set on bearing plates, as recommended by manufacturer for specific circumstances and a minimum Factory Mutual FM 1-75 uplift rating. Provide corner and perimeter enhancements as required for attachment in accordance with Factory Mutual requirements.
   2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
   3. Installation shall meet specified requirements and be in accordance with the manufacturer's installation instructions, technical manual, and approved shop drawings, following NRCA RWM and SMACNA ASMM criteria, the most stringent applies.

B. Installation of Insulation Cover Board and Underlayment, where indicated on Drawings:
   1. Coordinate installing roofing system components so insulation and cover board are not exposed to precipitation or left exposed at the end of the workday.
   2. Comply with roofing system manufacturer's written instructions for installing roofing insulation and cover board.
   3. Insulation shall have a solid bearing on deck and shall not cantilever.
   4. Place insulation and cover board with joints tightly butted with no more than 1/4 inch gaps. Stagger and offset joints. Install no more than can be completely roofed and flashed in the same work period. Install layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 12 inches in each direction.
   5. Attachment of Insulation and Cover Board: Mechanically fasten both insulation and cover board to substrate in accordance with manufacturer's instructions and meeting wind uplift requirements including perimeter and corner enhancements. Attachment shall meet uplift and warranty requirement. Installation using only mechanical fasteners to secure total thickness of cover board to deck. Provide required number of fasteners in the field, corner and perimeter of the roofing system to meet wind uplift requirements.
   6. Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof cover board under sheet metal roofing. Comply with temperature restrictions of underlayment manufacturer for installation. Install underlayment types and thickness in accordance with underlayment manufacturer and shingle manufacturer for application and warranty requirements. Apply over entire roof, in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 4 inches. Roll laps with roller. Install in accordance to written manufacturer’s instruction.

C. Accessories: Install all components required for a complete roofing assembly, including flashings, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, pre-formed roof jacks, soffit, fascia, snow guards, and similar roof accessory items in accordance with the manufacturer's written instructions.

D. Roof Panels: Install panels in strict accordance with manufacturer’s instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.

E. Flashings: Provide all flashings, related closures, and accessories necessary for a complete, watertight installation. Minimize exposed fastening of flashings. On sloped planes, form flashing lap joints to shed water and provide sealant within the lap area. Lap joints shall have minimum 4-inch overlap except where greater overlap is indicated, or otherwise required by the roof panel manufacturer. For butt joints of flashings, provide joint splice and cover plates supplemented by waterproof sealants and sealant tapes to form a watertight joint condition. Ensure firm underlying support for joints greater than 8-inches wide and where otherwise indicated or required by the roof panel manufacturer. Installation shall allow for expansion and contraction of flashing without impacting watertight integrity.

F. Installation using only mechanical fasteners to secure to substate. Provide the required number of fastener and clips in the field, corner and perimeter of the roofing system to meet wind uplift requirements. Fastening method and pattern to meet FM design requirements including corner and perimeter enhancements.

G. Do not permit storing, walking, wheeling, or trucking directly on roofed surfaces. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight to conform to live load limits of roof construction.

3.05 QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories at the start, midpoint and final installation stages, at a minimum. Report results in writing.

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

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.06 DAMAGED MATERIAL AND CLEANING

A. Damage caused by the manufacturer or roof panel systems contractor shall be repaired or replaced.

B. The general contractor shall inspect and approve each completed roof area and be responsible for protecting finished work from damage by other trades.

C. The roof panel systems contractor shall remove all protective materials and labels from the roof components as they are installed.

D. The general contractor shall be responsible for final cleaning of the roof panel system due to any conditions that occur after the roof panel systems contractor has completed an area. Cleaning is to be done in accordance with the manufacturer’s instructions.

END OF SECTION