# SECTION 074113 – STANDING SEAM ROOF PANELS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Formed and field-assembled standing-seam metal roof panels and appropriate underlayment material.

B. Related Sections include the following:

1. Division 5 Section "Steel Roof Decking" for steel roof deck supporting metal roof panels.
2. Division 7 Section "Metal Wall Panels" for factory-formed metal soffit panels.
3. Division 7 Section "Flashing and Sheet Metal" for fascia, copings, flashings and other sheet metal work not part of metal roof panel assemblies.
4. Division 7 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

### 1.3 DEFINITIONS

A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

B. Solar Flux: Direct and diffuse radiation from the sun received at ground level over the solar spectrum, expressed in watts per square meter.

C. Solar Reflectance: Fraction of solar flux reflected by a surface, expressed as a percent or within the range of 0.00 and 1.00.

### 1.4 PERFORMANCE REQUIREMENTS

A. Performance standards in these documents are intended to provide the Owner with a standard of quality. Roofing systems supplied by the manufacturer chosen by the bidder must meet/exceed all of the stated materials and roof system performance characteristics, referenced code approval (FM, UL, and IBC) wind uplift and fire resistance criteria, on site quality control, and warranty and post-installation maintenance agreement requirements. The Architect and Owner shall provide sole and final determination as to the acceptance and approval of the Bidders roofing system.

B. General: 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.

C. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift resistance Class 90.

D. Air and Water Infiltration: Provide test results of ASTM test E1646 Standard test method for water penetration of exterior metal roof and siding systems by uniform static air pressure difference and ASTM test E1680 Standard test method or air leakage through exterior metal roof and siding systems.

E. Provide test results showing specified panel assembly passing ASTM E2140-01 Standard Test Method for Water Penetration of Metal Roof Panel System by Static Water Pressure Head. (Hydrostatic Roof System Test)

F. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to procedures listed in ASTM E 1592:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:
   a. Uniform pressure as indicated on Drawings.
   b. Wind Speed: 120 mph.

2. Snow Loads: 30 lbf / sq. ft.
   Live Loads: 30 lbf / sq. ft.

3. Deflection Limits: Engineer metal roof panel assemblies to withstand design loads with calculated vertical deflections no greater than 1/180 of the span.

G. Thermal Movements: Provide metal roof panel assemblies that allow for 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.

H. Metal panel assembly shall be listed with Underwriters' Laboratories as Class A roof systems with regards to their resistance to external flame sources.

I. Metal panel shall be listed with Underwriters' Laboratories as Class 4 Hail resistant panels.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal roof panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, accessories, and special details and should be specific to this project. All drawings to be stamped and sealed by an engineer employed by the metal roof manufacturer and shall be registered in the state of Delaware. Distinguish between factory and field-assembled work.

1. Accessories: Include details of the following items:

   a. Flashing and trim.
   b. Gutters.
   c. Downspouts.
   d. Roof curbs.
   e. Pipe penetration flashings
   f. Snow guards.

2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Roof Panels: 12 inches long by actual panel width. Include fasteners, clips, closures, and other metal roof panel accessories.
2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Vapor Retarders: 6-inch- square Samples.
4. Accessories: 12-inch long Samples for each type of accessory.

E. Material Certificates: For thermal insulation signed by manufacturers.

F. Qualification Data: Installer, Professional Engineer.

G. Field quality-control inspection reports.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:

1. Metal Roof Panels: Include reports for air infiltration, water penetration, thermal performance, fire-test-response characteristics, solar reflectance and structural performance.
2. Insulation and Vapor Retarders: Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.

I. Maintenance Data: For metal roof panels to include in maintenance manuals.

J. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer, having completed a documented, comprehensive manufacturer's installation training program, and having a minimum of three (3) years experience installing the manufacturer's product.

1. Installer's responsibilities include installation of metal roof panel assemblies and providing professional engineering services by metal roof panel manufacturer.
2. Engineering Responsibility: Preparation of data for metal roof panels, including Shop Drawings, based on testing and engineering analysis, by an independent engineer registered in the State of Delaware, of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Source Limitations: Obtain metal roof panels through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal roof panels and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Fire-Resistance Ratings: Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

2. Metal roof panels shall be identified with appropriate markings of applicable testing and inspecting agency.

E. Preliminary Roofing Conference: Before starting roof construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 1 Section "Project Management and Coordination." Review methods and procedures related to roof joist construction and metal roof panels including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's representative, joist Installer, 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. Examine joist conditions for compliance with requirements, including flatness and attachment to structural members.
5. Review structural loading limitations of joist 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.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's representative, deck Installer, 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. Examine deck substrate, purlins and rafter conditions for compliance with requirements, including flatness and attachment to structural members.
5. Review structural loading limitations of deck and joist 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 panel assembly during and after installation.
9. Review roof observation and repair procedures after metal roof panel installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.

B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.

1.8 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 manufacturers' 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 Approval Drawings.

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 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations, which are specified in Division 7 Section "Roof Accessories." Provide roof system manufacturer's curbs.

B. Roof installer must supply and install roof accessories that are approved, supplied, and warranted by the roofing manufacturer, and according to manufacturer's recommended details.

C. Coordinate metal panel roof assemblies with rain drainage work, flashing, trim, and construction of decks, joist parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Standard Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal roof panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: One year from date of final Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, 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 bare metal.

2. 20-year period is for fluoropolymer finish and is maximum included with manufacturers' published data; 10-year period is usually available for siliconized polyester.
3. Finish Warranty Period: 20 years from date of Final Completion.

C. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period. This warranty will include the roof panels, trims, transitions, pipe penetration flashings, curbs and gutters.

1. 1. Warranty Period: 20 years from date of Substantial Completion.

D. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Furnish a single manufacturer, twenty (20) year full system warranty, including five (5) year contractor/installer warranty, covering all new components installed above the roof deck, including insulation, fasteners, metal roof, all metal roof trims and transitions, manufacturer supplied curbs, pipe penetration flashings, and all metal wall panels installed with the metal roof.

1. Warranty Period: 20 years from date of Substantial Completion.

2. Warranty Limit of Liability: Installed cost of metal roof system including labor and materials.

a. Warranty must include paint adhesion for the full term of the warranty
b. Warranty must include detailed description of warranty extension options.
c. Manufacturer will at it's own expense, repair or cause to be repaired, any damage found in the above outlined new roof system, as a result of failure of any of the system components after the warranty is provided to the Owner.
d. Manufacturer will provide local on site Technical Field Inspectors (non-sales), to visit the project a minimum of two (2) times per week to monitor the installation. Manufacturer will provide field reports to the Owners representative after each visit.
e. Manufacturer shall provide the Owners representative with a written resume stating qualifications of this inspector.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Subject to compliance with requirements, provide products by The Garland Company, Inc. or comparable product by one of the following:

1. Tremco, Inc.
2. Bemo USA, Inc.

B. Prequalified Substitutions: Bidders proposing an equivalent substitution shall submit all information required and in accordance with the standards set forth in this specification section to the Architect no later than ten (10) days prior to the bid date. If acceptance of the proposed substitute is given, it will be by addenda.

1. Roof Manufacturer Compliance Checklist: Bidders proposing an equivalent substitution shall submit a fully completed copy of the checklist found at the end of this specification section.
2. Bidders proposing an equivalent substitution shall submit all technical (ASTM D-5147) verified testing information that meets or exceeds the minimum standards set forth in the specification. The responsive bidder must submit in triplicate all testing of materials submitted, notarized and

tested by an accredited third party testing facility. Manufacturer technical data sheets will not be accepted as a basis for comparison.

C. The Architect shall be the sole judge as to whether or not an item submitted is an equivalent. Should the contractor choose to submit a request for acceptance of a substitution, he shall assume all risk involved, monetary or otherwise should the Architect find it unacceptable.

D. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

F. Available Product: Subject to compliance with requirements, manufacturers that may be incorporated into the Work include, but are not limited to, the following:

1. Panels

   a. R-Mer Span Roof System by The Garland Company, Inc.3800 East 91st Street Cleveland, Ohio.
   b. Metal Panel Tremlock VP Roof System by Tremco Incorporated, 3734 Green Road, Beachwood, Ohio.
   c. Equivalent product by Bemo USA, Inc.

2. Underlayment Sheets

   a. W.R. Grace & Co. –Conn. 62 Whittemore Avenue, Cambridge, Massachusetts 02140.
   b. Carlisle Coatings & Waterproofing, Inc., 900 Hensley Lane, Wylie, Texas 75098.

3. Roof Insulation Boards

   a. Firestone Building Products Company, 525 Congressional Boulevard, Carmel, Indiana 46032.
   b. Carlisle SynTec Systems, Inc., P.O. Box 7000, Carlisle, Pennsylvania 17013.

## 2.2 PANEL MATERIALS

A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.

2. Surface: Smooth finish.

3. Exposed Finishes: Apply the following coil coating, as specified or indicated on Drawings.

   a. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

(1) Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing with a minimum total dry film thickness of 0.9 mil; not less than 70 percent polyvinylidene fluoride resin.

4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 99 percent solids, gray butyl rubber compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1 inch wide and 1/16 inch thick minimum containing nylon spacer beads.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant containing nylon spacer beads.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, SBS Base Sheet: ASTM D1970-00, .080 in. thick minimum, consisting of specially blended SBS modified asphalt above the fiberglass mat, with an SIS modified self adhesive bitumen blend below the fiberglass reinforcement. The bottom is provided with release-paper backing; cold applied.

1. Products:

a. W. R. Grace Ultra Heat Resistant Roofing Underlayment Sheet.
b. Carlisle CCW WIP 403HR Heat Resistant Roofing Underlayment Sheet.

B. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft. if necessary.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of factory-applied coating.

1. Fasteners for Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

2.5 STANDING-SEAM METAL ROOF PANELS

A. Vertical-Rib, Seamed-Joint, Continuous–Run Standing-Seam Metal Roof Panels: Factory-formed and field-formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and mechanically seaming panels together. Metal roof panel and trims are to utilize hydrostatic details at all trims, transitions, and penetrations.

1. Basis-of-Design Product: Tremco TremLock VP, Tremco Inc. Beachwood, Ohio.
2. Material: G-90 Zinc-coated galvanized steel sheet, .0276 (24 guage) thick.

a. Exterior Finish: "Kynar 500/Hylar 5000".
b. Color: Custom.

3. Clips: One-piece or two-piece Low Moveable Clip to accommodate thermal movement within the sheet. *Fixed clips are not permitted for use.*

a. Material: .0336 thick, zinc-coated (galvanized) steel sheet.
b. Clip spacing to meet requirements of IBC.

4. Joint Type: Single folded.
5. Panel Coverage: 16 inches.
6. Panel Height 2.0 inches.
7. Uplift Rating: UL 90.
8. No end laps are permitted.

B. Field-roll formed panels must be roll formed on factory owned and operated equipment, the roll former must have a minimum of 12 stands, and all performance and warranty requirements defined elsewhere in this specification must be met. Portable roll formers operated by the roofing contractor will <u>not</u> be permitted.

2.6 ACCESSORIES

A. Roof Panel Accessories: 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. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
2. Clips: Minimum 0.0336 thick, one-piece or two-piece galvanized steel panel clips designed to withstand negative-load requirements.
3. Backing Plates: Provide metal backing plates at panel end splices, pre-fabricated from manufacturer with stainless steel studs.

B. Flashing and Trim: Formed from 24 gauge thick, zinc-coated (galvanized) steel sheet, prepainted 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 system as adjacent metal roof panels. All details will be installed utilizing hydrostatic joinery.

C. Exterior Metal Gutters: Formed from 24 gauge thick, zinc-coated (galvanized) steel sheet repainted with coil coating. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in maximum length possible to minimize joints. Furnish gutter supports per manufacturers' standard, installed without through-fastening of panel. Provide wire ball strainers at outlets. Finish gutters to match metal roof panels or roof fascia and rake trim.

D. Downspouts: Formed from 26 gauge thick, zinc-coated (galvanized) steel sheet prepainted with coil coating; in 10-foot long sections, complete with formed elbows and offsets. Finish downspouts to match metal roof panels as per noted on drawings.

E. Roof Curbs: Fabricated from aluminum sheet per manufacturer's standard, with integral internal flange for attachment minimizing through fastening. Roof curbs to be supplied by the metal roof manufacturer and to be included with weathertightness warranty.

1. Insulate roof curb with 1-inch- thick, rigid insulation.

F. Snow Guards: Prefabricated, noncorrosive units designed to be installed without penetrating metal roof panels, and complete with predrilled holes, clamps, or hooks for anchoring.

1. Seam-Mounted, Bar-Type Snow Guards: Aluminum rods or bars held in place by stainless-steel clamps attached to vertical ribs of standing-seam metal roof panels.

    a. Aluminum Finish: Kynar 500/ hylar 5000 color to match metal roof panels
    b. Stainless-Steel Finish: Mill.
    c. Products:

        1) LMCurbs; S-5! SnoFence.
        2) Snow Management Systems, a division of Contek, Inc.; Vermont Snowguard.
        3) Roofing Manufacturer's system that meets all performance requirements.

G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base and stainless steel pipe clamp to secure collar to pipe. Pipe penetration flashings to be supplied by the metal roof manufacturer and to be included with weathertightness warranty.

2.7 THERMAL INSULATION

A. Rigid Board Insulation: Insulation board shall be rigid polyisocyanurate foam plastic with a asphalt coated felt facer meeting the requirements of ASTM C 1289, Type II, Class 1.

B. Long Term Thermal Resistance of Rigid Board Insulation shall be not less than value of 30.0. Long Term R-values shall be determined using a 15 year time-weighted average in accordance with CAN/ULC S770.

C. Rigid Board Insulation shall have a compressive strength not less than 20 psi as per the requirements of ASTM D1621.

D. Rigid Board Insulation shall be a standard product with the insulation manufacturer, factory marked or identified with insulation manufacturer's name or trademark and R-value. Identification shall be on individual pieces or individual packages. Insulation, including facings, shall have a flame spread rating and a smoke developed rating in accordance with ASTM E 84.

E. Rigid Board Insulation Fastener Assemblies shall be a standard FM Global approved product supplied by the insulation manufacturer. Each fastener assembly shall consist of a self-drilling self-tapping fluorocarbon coated steel screw and 3 inch diameter Galvalume coated steel plate washer.

2.8 FABRICATION

A. General: Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Where indicated, fabricate metal roof panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with manufacturers' standard.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Conceal fasteners and expansion provisions where possible.
3. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal roof panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal roof panel manufacturer for application but not less than thickness of metal being secured.

2.9 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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 work.

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. 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.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

B. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

C. Install fascia and copings to comply with metal roof manufacturers standard details.

1. Miscellaneous Framing: Install roof decking, subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written recommendations.

3.3 INSULATION BOARD INSTALLATION

A. General: Provide and install insulation boards over roof decking covered with vapor barrier sheets and secure to the steel roof decking using FM Approved fluorocarbon coated steel screws and Galvalume plate washers.

1. Install full-sized boards and stagger end joints of insulation boards 12 inches. Only half boards or larger shall be used at perimeters and corners. Small filler boards shall be used in the field of the roof prior to roof boards placement at perimeters and corners.

2. Butt roof boards tight to adjacent boards, leaving not more than ¼ inch gaping at junctures. Roof boards shall be cut to fit tightly around all penetrations and at all nailers and curbs.

3. Secure each insulation board to the roof deck using six (6) fastener assemblies. Place each of four of the fastener assemblies 6 inches in from the edge of insulation board.

4. Minimize construction traffic on the installed roof boards. Roof boards damaged by traffic shall be removed and replaced. Cost for removal and replacement shall be at the sole cost of the contractor.

5. Roof boards shall not be exposed to weather resulting in moisture infiltration. Contractor shall not apply more roof boards in one day than can be completely covered with the required roof membrane on that day. Furring channels must be wire-tied to supports in most fire-resistance-rated assemblies. Verify requirements of assemblies and revise below to suit Project.

3.4 UNDERLAYMENT INSTALLATION.

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on each roof insulation board 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 as per manufacturers recommended instructions, 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 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days or follow underlayment manufacturer's guidelines.

1. Extend underlayment sheets over rake edges and 4 inches downward over the top of the facade.
2. Extend underlayment sheets over roof to wall intersections for a 4 inch vertical distance.
3. Extend underlayment sheets around dormers, chimneys, skylights, and other penetrating elements for a distance of 4 inches vertically.

B. Sheeting Paper: Install red-rosin sheet over self-adhering sheet before installing metal roof panels.

3.5 METAL ROOF PANEL INSTALLATION, GENERAL

A. General: 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. Utilize hydrostatic joinery throughout. No joinery to be dependent on exterior sealants to ensure weathertightness.

1. Field cutting of metal roof panels by torch or abrasive cut-saw is not permitted.
2. Install panels perpendicular to purlins.
3. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction.
4. Provide pre-fabbed and pre-drilled metal closures at peaks, rake edges, rake walls 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. Locate and space fastenings in uniform vertical and horizontal alignment per shop drawings.
7. Install ridge and hip caps as metal roof panel work proceeds.
8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
9. Lap metal flashing over metal roof panels to allow moisture to run over and off the material.

B. Fasteners:

1. Steel Roof Panels: Use manufacturer's standard corrosion resistant steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.

C. Joint Sealers: Install sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide sealants recommended by metal roof panel manufacturer.

1. Seal metal roof panel end laps with manufacturer's recommended sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.6 FIELD-ASSEMBLED METAL ROOF PANEL INSTALLATION

A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips placed on bearing plates at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Clips: Install clips to supports with self-tapping fasteners.
2. Bearing Plates: Install bearing plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Form standing seams with manufacturer-approved motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

3.7 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

C. Exterior Metal Gutters: Join sections with riveted, lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Tie downspouts to underground drainage system indicated.

E. Roof Curbs: Install curbs supplied by metal roof manufacturer, at locations indicated on Drawings. Curbs to be of internal flange design.

F. Bar-Type Snow Guards: Attach bar supports to vertical ribs of standing-seam metal roof panels with clamps or set screws. Do not use fasteners that will penetrate metal roof panels.

1. Provide one snow guard at each roof panel. Space as recommended by manufacturer.

G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels with aluminum blind-type clamping fastener.

3.8 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of ¼ inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage an authorized manufacturer's representative to inspect two(2) work days during each week of the installation of the metal roofing system and perform a pre-final and final inspect of the completed metal roof panel installation, including accessories. 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.

3.10 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113