SECTION 07610 - SHEET METAL ROOFING

1 GENERAL

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.

2. SUMMARY

a. Section Includes:
   1) Standing-seam metal roofing, on-site, roll formed.

b. Related Sections:

   1) Division 7 Section "Building Insulation" for roof insulation and sheet vapor retarders separate from self-adhering underlayments.
   2) Division 7 Section "Metal Roof Panels" for factory-formed metal soffit panels.
   3) Division 7 Section "Sheet Metal Flashing and Trim" for gutters, downspouts, fasciae, copings, and flashings that are not part of sheet metal roofing.
   4) Division 7 Section "Roof Accessories" for manufactured roof accessories.
   5) Division 7 Section "Joint Sealants" for field-applied sealants adjoining sheet metal roofing.

3. PERFORMANCE REQUIREMENTS

a. General Performance: Sheet metal roofing system including, but not limited to, metal roof panels, cleats, clips, anchors and fasteners, sheet metal flashing integral with sheet metal roofing, fascia panels, trim, underlayment, and accessories shall comply with requirements indicated without failure due to defective manufacture, fabrication, installation, or other defects in construction. Sheet metal roofing shall remain watertight.

b. Thermal Movements: Provide sheet metal roofing that allows for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1) Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

c. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

4. ACTION SUBMITTALS

a. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

b. LEED Submittals:

1) Product Test Reports for Credit SS 7.2: For roof panels, documentation indicating that panels comply with Solar Reflectance Index requirement.

c. Shop Drawings: Show fabrication and installation layouts of sheet metal roofing, including plans, elevations, expansion joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1) Details for forming sheet metal roofing, including seams and dimensions.
2) Details for joining and securing sheet metal roofing, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
3) Details of termination points and assemblies, including fixed points.
4) Details of expansion joints, including showing direction of expansion and contraction.
5) Details of roof penetrations.
6) Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings.
7) Details of special conditions.
8) Details of connections to adjoining work.
9) Detail the following accessory items, at a scale of not less than 3 inches per 12 inches:

a) Flashing and trim.
b) Gutters and downspouts as they relate to adjacent sheet metal roofing.
c) Roof curbs.
d) Snow guards.

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

1) Sheet Metal Roofing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners and other attachments.
2) Trim and Metal Closures: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
3) Snow Guards: Full-size Sample.
4) Other Accessories: 12-inch- (300-mm-) long Samples for each type of other accessory.

5. INFORMATIONAL SUBMITTALS

a. Portable Roll-Forming Equipment Certificate: Issued by UL for equipment manufacturer's portable roll-forming equipment capable of producing panels that comply with UL requirements. Show expiration date no earlier than two months after scheduled completion of sheet metal roofing.

1) Submit certificates indicating recertification of equipment whose certification has expired during the construction period.

b. Qualification Data: For qualified Installer.

c. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

d. Warranties: Sample of special warranties.

6. CLOSEOUT SUBMITTALS

a. Maintenance Data: For roofing sheet metals and accessories to include in maintenance manuals.

7. QUALITY ASSURANCE

a. Custom-Fabricated Sheet Metal Roofing Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal roofing similar to that required for this Project and whose products have a record of successful in-service performance.

b. Roll-Formed Sheet Metal Roofing Fabricator Qualifications: Fabricator authorized by portable roll-forming equipment manufacturer to fabricate and install sheet metal roofing units required for this Project, and who maintains current UL certification of its portable roll-forming equipment.

c. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing roofing panels for sheet metal roofing assemblies that comply with UL 580 for [**Class 30**] [**Class 60**] [**Class 90**] wind-uplift resistance. Maintain UL certification of portable roll-forming equipment for duration of sheet metal roofing work.

d. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

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."

1) Review methods and procedures related to roof construction and sheet metal roofing including, but not limited to, items listed for the Preinstallation Conference.

f. Preinstallation Conference: Conduct conference at Project site.

1) Meet with Owner, Architect, Owner's insurer if applicable, sheet metal roofing Installer, portable roll-forming equipment manufacturer's representative for sheet metal roofing and installers whose work interfaces with or affects sheet metal roofing 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 sheet metal roofing installation, including portable roll-forming equipment manufacturer's written instructions.
4) Examine conditions of substrate for compliance with requirements, including flatness and attachment to structural members.
5) Review structural loading limitations of roof deck during and after roofing installation.
6) Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal roofing.
7) Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
8) Review temporary protection requirements for sheet metal roofing during and after roofing installation.
9) Review roof observation and repair procedures after sheet metal roofing installation.
10) Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

8. DELIVERY, STORAGE, AND HANDLING

a. Do not store sheet metal roofing materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal roofing materials away from uncured concrete and masonry.

b. Protect strippable protective covering on sheet metal roofing from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal roofing installation.

9. COORDINATION

a. Coordinate installation of roof curbs, equipment supports, and roof penetrations, which are specified in other Sections.

b. Coordinate sheet metal roofing with rain drainage work, flashing, trim, and construction of parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

10. WARRANTY

a. Special Warranty: Warranty form at the end of this Section in which Installer agrees to repair or replace components of sheet metal roofing that fail in materials or workmanship within specified warranty period.

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

a) Structural failures, including but not limited to rupturing, cracking, or puncturing.
b) Wrinkling or buckling.
c) Loose parts.
d) Failure to remain weathertight, including uncontrolled water leakage.
e) Deterioration of metals, metal finishes, and other materials beyond normal weathering, including non-uniformity of color or finish.
f) Galvanic action between sheet metal roofing and dissimilar materials.

2) Warranty Period: Five years from date of Substantial Completion.

b. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1) Exposed Panel 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) Finish Warranty Period: Ten years from date of Substantial Completion.

2 PRODUCTS

1. ROOFING SHEET METALS

a. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

b. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1) Thickness: [**0.032 inch (0.81 mm)**] unless otherwise indicated.

2) As-Milled Finish: Mill finish.
3) Surface: Smooth, flat.
4) Exposed Coil-Coated Finish:
a) Metallic Fluoropolymer: AAMA 620. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

5) Color: Match Architect's samples.
6) Concealed Finish: Pretreat with 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 (0.013 mm).

c. Zinc-Tin Alloy-Coated Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead-soft, fully annealed stainless-steel sheet, coated on both sides with a zinc-tin alloy (50 percent zinc, 50 percent tin), with factory-applied gray preweathering.

1) Products: Subject to compliance with requirements:

a) Follansbee Steel; TCS II.

2) Thickness: **0.015-inch (0.38-mm)** minimum uncoated thickness, with 0.787-mil (0.020-mm) coating thickness applied to each side.

2. MISCELLANEOUS MATERIALS

a. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.

b. Snap-On Seams: Provide snap-on seams integrated with panel-edge profile as recommended by portable roll-forming equipment manufacturer to produce sheet metal roofing assemblies that comply with UL 580 for wind-uplift resistance classification specified in "Quality Assurance" Article.

c. Fasteners: Wood screws, annular-threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1) General:

a) Exposed Fasteners: Heads matching color of sheet metal roofing using plastic caps or factory-applied coating.
b) Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
c) Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2) Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3) Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.

d. Solder:
1) For Zinc-Tin Alloy-Coated Stainless Steel: ASTM B 32, 100 percent tin.

e. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

f. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by portable roll-forming equipment manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal roofing and remain watertight.

g. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

h. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

3. ACCESSORIES

a. Sheet Metal Accessories: Provide components required for a complete sheet metal roofing assembly including trim, copings, fasciae, corner units, clips, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items. Match material and finish of sheet metal roofing unless otherwise indicated.

1) Provide accessories as recommended by portable roll-forming equipment manufacturer to produce sheet metal roofing assemblies that comply with UL 580 for wind-uplift resistance classification specified in "Quality Assurance" Article.
2) Cleats: For mechanically seaming into joints and formed from the following materials:

a) Aluminum Roofing: **0.0250-inch-** thick stainless steel.
b) Zinc-Tin Alloy-Coated Stainless-Steel Roofing: Manufacturer's preformed cleats or cleats fabricated from manufacturer's thickest flat-stock sheet.
c) Zinc Roofing: Manufacturer's preformed stainless-steel cleats.

3) Clips: Minimum 0.0625-inch- (1.6-mm-) thick, stainless-steel panel clips designed to withstand negative-load requirements.
4) Backing Plates: Plates at roofing splices, fabricated from material recommended by SMACNA.
5) Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible-closure strips; cut or premolded to match sheet metal roofing profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
6) Flashing and Trim: Formed from same material and with same finish as sheet metal roofing, minimum [**0.018 inch (0.46 mm)**] <**Insert thickness**> thick.

4. SNOW GUARDS

a. Snow Guards, General: Prefabricated, noncorrosive units designed to be installed without penetrating sheet metal roofing; complete with predrilled holes, clamps, or hooks for anchoring.

b. Surface-Mounted, Metal, Stop-Type Snow Guards: Cast-aluminum stops designed for attachment to panel surface of sheet metal roofing using construction adhesive, silicone or polyurethane sealant, or adhesive tape.

5. FABRICATION

a. General: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions (panel width and seam height), geometry, metal thickness, and other characteristics of installation indicated. Fabricate sheet metal roofing and accessories at the shop to greatest extent possible.
   1) Standing-Seam Roofing: Form standing-seam panels with finished seam height **of 1-1/2 inches (38 mm)**.
   2) General: Fabricate roll-formed sheet metal roofing panels with UL-certified, portable roll-forming equipment capable of producing roofing panels for sheet metal roofing assemblies that comply with UL 580 for wind-uplift resistance classification specified in "Quality Assurance" Article. Fabricate roll-formed sheet metal according to equipment manufacturer's written instructions and to comply with details shown.

b. Fabrication Tolerances: Fabricate sheet metal roofing that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

c. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks; true to line and levels indicated; and with exposed edges folded back to form hems.

   1) Lay out sheet metal roofing so transverse seams, if required, are made in direction of flow with higher panels overlapping lower panels.
   2) Offset transverse seams from each other **12 inches (300 mm)** minimum.
   3) Fold and cleat eaves and transverse seams in the shop.
   4) Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown on Drawings and as required for leakproof construction.

d. Expansion Provisions: Fabricate sheet metal roofing to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the Work. Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

e. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required to produce weathertight seams, form metal to provide for proper installation of elastomeric sealant in compliance with SMACNA standards.

f. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing or manufacturers of the metals in contact.

g. Sheet Metal Accessories: Custom fabricate flashings and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

1) Form exposed sheet metal accessories without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
2) Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
3) Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

h. Do not use graphite pencils to mark metal surfaces.

3 EXECUTION

1. EXAMINATION

a. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1) Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking, that tops of fasteners are flush with surface, and that installation is within flatness tolerances required for finished roofing installation.
2) Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored, and that provision has been made for drainage, flashings, and penetrations through sheet metal roofing.

b. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

c. Examine roughing-in for components and systems penetrating sheet metal roofing to verify actual locations of penetrations relative to seam locations of sheet metal roofing before installation.

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

2. UNDERLAYMENT INSTALLATION

a. Polyethylene Sheet: Install polyethylene sheet on roof sheathing under sheet metal roofing. Use adhesive for anchorage to minimize use of mechanical fasteners under sheet metal roofing. Apply at locations indicated on Drawings, in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches (50 mm).

b. Felt Underlayment: Install felt underlayment on roof sheathing under sheet metal roofing. Use adhesive for temporary anchorage to minimize use of mechanical

fasteners under sheet metal roofing. Apply at locations indicated, 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.

c. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under sheet metal roofing. Apply primer if required by underlayment 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**], 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). Roll laps with roller. Cover underlayment within 14 days.

1) Roof perimeter for a distance up from eaves of **36 inches (900 mm)** beyond interior wall line.
2) Valleys, from lowest to highest point, for a distance on each side of [**18 inches (460 mm)**. Overlap ends of sheets not less than 6 inches (150 mm).
3) Rake edges for a distance of [**18 inches (460 mm)**.
4) Roof to wall intersections for a distance from wall of **18 inches (460 mm)**.

d. Install flashings to cover underlayment to comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim."

e. Apply slip sheet before installing sheet metal roofing.

3. INSTALLATION, GENERAL

a. General: Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.

1) Field cutting of sheet metal roofing by torch is not permitted.
2) Flash and seal sheet metal roofing with closure strips at eaves, rakes, and perimeter of all openings. Fasten with self-tapping screws.
3) Locate and space fastenings in uniform vertical and horizontal alignment. Predrill panels for fasteners.
4) Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid a four-panel lap splice condition. Install backing plates at roofing splices.
5) Install sealant tape where indicated.
6) Lap metal flashing over sheet metal roofing to allow moisture to run over and off the material.
7) Do not use graphite pencils to mark metal surfaces.

b. Thermal Movement. Rigidly fasten metal roof panels to structure at only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction.

1) Point of Fixity: Fasten each panel along a single line of fixing.
2) Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.

c. Fasteners: Use fasteners of sizes not less than recommended by fastener manufacturer to achieve maximum pull-out resistance**.**

d. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by SMACNA.

1) Coat back side of uncoated aluminum and stainless-steel sheet metal roofing with bituminous coating where roofing will contact wood, ferrous metal, or cementitious construction.

e. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

f. Fasciae: Align bottom of sheet metal roofing and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal sheet metal roofing with closure strips where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

4. CUSTOM-FABRICATED SHEET METAL ROOFING INSTALLATION

a. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges unless otherwise indicated.

1) Install cleats to hold sheet metal panels in position. Attach each cleat with two fasteners to prevent rotation.
2) Fasten cleats not more than 12 inches (300 mm) o.c. Bend tabs over fastener head.
3) Provide expansion-type cleats and clips for roof panels that exceed 30 feet (9.1 m) in length.

b. Seal joints as shown and as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams.

1) Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting

proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2) Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

c. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except reduce pre-tinning where pre-tinned surface would show in completed Work.

1) Do not solder aluminum sheet.
2) Do not pre-tin zinc-tin alloy-coated stainless steel.
3) Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

d. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

e. Standing-Seam Roofing: Attach standing-seam metal panels to substrate with cleats, double fastened at **12 inches (305 mm)** o.c. Install panels reaching from eave to ridge before moving to adjacent panels. Before panels are interlocked, apply continuous bead of sealant to top of flange of lower panel. Lock standing seams by folding over twice so cleat and panel edges are completely engaged.

1) Lock each panel to panel below with sealed transverse seam.

RETAIN ONE OF FIRST TWO SUBPARAGRAPHS BELOW. RETAIN FIRST SUBPARAGRAPH FOR ALL AREAS EXCEPT THOSE SUBJECT TO ICE DAMS. RETAIN SECOND SUBPARAGRAPH FOR EAVES SUBJECT TO ICE DAMS IF DESIGNING ACCORDING TO FIGURE 6-16 IN SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL." INCLUDE DETAIL ON DRAWINGS.

2) Loose-lock panels at eave edges to continuous cleats and flanges at roof edge at gutters.
3) Loose-lock panels at eave edges to continuous edge flashing exposed 24 inches (610 mm) from roof edge. Attach edge flashing to face of roof edge with continuous cleat fastened to roof substrate at **12 inches (305 mm)** o.c. Lock panels to edge flashing.

5. ON-SITE, ROLL-FORMED SHEET METAL ROOFING INSTALLATION

a. General: Install on-site, roll-formed sheet metal roofing fabricated from UL-certified equipment to comply with equipment manufacturer's written instructions for UL wind-uplift resistance class indicated. Provide sheet metal roofing of full length from eave to ridge unless otherwise restricted by on-site or shipping limitations.

b. Standing-Seam Sheet Metal Roofing: Fasten sheet metal roofing to supports with concealed clips at each standing-seam joint at location, at spacing, and with fasteners recommended by manufacturer of portable roll-forming equipment.

1) Install clips to substrate with self-tapping fasteners.
2) Install pressure plates at locations indicated in equipment manufacturer's written installation instructions.
3) Before panels are joined, apply continuous bead of sealant to top of flange of lower panel.
4) Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so cleat, sheet metal roofing, and field-applied sealant are completely engaged.

c. Seal joints as shown and as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams.

1) Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2) Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

6. 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 sheet metal roofing assembly including trim, copings, seam covers, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items.
2) Install accessories integral to sheet metal roofing that are specified in Division 7 Section "Sheet Metal Flashing and Trim" to comply with that Section's requirements.

b. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." 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 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.
2) Install continuous strip of self-adhering underlayment at edge of continuous flashing overlapping self-adhering underlayment, where "continuous seal strip" is indicated in SMACNA's "Architectural Sheet Metal Manual," and where indicated on Drawings.
3) Install exposed flashing and trim without excessive oil canning, buckling, and tool marks and 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.

4) Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, and filled with butyl sealant concealed within joints.

c. Pipe Flashing: Form flashing around pipe penetration and sheet metal roofing. Fasten and seal to sheet metal roofing as recommended by SMACNA.

d. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet sheet metal roofing.

e. Stop-Type Snow Guards: Attach snow guards to sheet metal roofing with adhesive or adhesive tape, as recommended by manufacturer. Do not use fasteners that will penetrate sheet metal roofing.

1) Provide snow guards at locations indicated on Drawings.

7. ERECTION TOLERANCES

a. Installation Tolerances: Shim and align sheet metal roofing within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

8. CLEANING AND PROTECTION

a. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

b. Clean and neutralize flux materials. Clean off excess solder.

c. Clean off excess sealants.

d. Remove temporary protective coverings and strippable films as sheet metal roofing is installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal roofing installation, clean finished surfaces as recommended by sheet metal roofing manufacturer. Maintain sheet metal roofing in a clean condition during construction.

e. Replace sheet metal roofing components that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

9. ROOFING INSTALLER'S WARRANTY

a. WHEREAS <**Insert name**> of <**Insert address**>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1) Owner: <**Insert name of Owner**>.
2) Address: <**Insert address**>.
3) Building Name/Type: <**Insert information**>.
4) Address: <**Insert address**>.
5) Area of Work: <**Insert information**>.
6) Acceptance Date: <**Insert date**>.
7) Warranty Period: <**Insert time**>.
8) Expiration Date: <**Insert date**>.

b. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

c. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

d. This Warranty is made subject to the following terms and conditions:

1) Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

a) Lightning;

INSERT REQUIRED WIND SPEED BELOW.

b) Peak gust wind speed exceeding <**Insert wind speed**> mph (m/sec);
c) Fire;
d) Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
e) Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
f) Vapor condensation on bottom of roofing; and
g) Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2) When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3) Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4) During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing

Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5) During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6) Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7) This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

e. IN WITNESS THEREOF, this instrument has been duly executed this <**Insert day**> day of <**Insert month**>, <**Insert year**>.

1) Authorized Signature: <**Insert signature**>.
2) Name: <**Insert name**>.
3) Title: <**Insert title**>.

END OF SECTION 07610