

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Manufactured Products:

- a. Manufactured through-wall flashing and counterflashing.
 - b. Manufactured reglets and counterflashing.

- 2. Formed Products:

- a. Formed roof drainage sheet metal fabrications.
 - b. Formed low-slope roof sheet metal fabrications.
 - c. Formed steep-slope roof sheet metal fabrications.
 - d. Formed wall sheet metal fabrications.
 - e. Formed equipment support flashing.
 - f. Formed overhead-piping safety pans.

- B. Related Sections:

- 1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft.: 90-lbf/sq. ft. perimeter uplift force, 120-lbf/sq. ft. corner uplift force, and 45-lbf/sq. ft. outward force.

- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

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

1.4 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. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 4. Details of termination points and assemblies, including fixed points.
 - 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 - 6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 7. Details of special conditions.
 - 8. Details of connections to adjoining work.
 - 9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 - 3. Accessories and Miscellaneous Materials: Full-size Sample.
 - 4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.
- E. Qualification Data: For qualified fabricator.
- F. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

- G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Copper Sheet Metal Standard: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. Preinstallation Conference: Conduct conference at Project site.
1. Meet with University and University's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 2. Review methods and procedures related to sheet metal flashing and trim.
 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim 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: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.
 1. Non-Patinated Exposed Finish: Mill.
 2. Pre-Patinated Copper-Sheet Finish: <Insert color>, pre-patinated according to ASTM B 882.
- C. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 1. Surface: Smooth, flat.
 2. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
 3. Exposed Coil-Coated Finishes: (**select one from below**)
 - a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish 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.
 - b. Mica Fluoropolymer: AAMA 620. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 4. Color: Match University's sample
 5. 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.
- D. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed. **Select finish below. Finish 2B is appropriate where flashing is mostly unseen.**
 1. Finish: 2B (dull, cold rolled) (**4 (polished directional satin)**).
 2. Surface: [**Smooth, flat**] [**Embossed**].
- E. Metallic-Coated Steel Sheet: Restricted flatness 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, flat.
 3. Exposed Coil-Coated Finish: **select one from below**
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 4. Color: Match University's sample.
 5. 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.
- F. Zinc Sheet: Zinc, 99 percent pure, alloyed with a maximum of 1 percent copper and titanium; with manufacturer's standard factory-applied, flexible, protective back coating.
1. Products: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. Rheinzink America Inc.; RHEINZINK ProRoofing.
 - b. Umicore Building Products USA Inc.; VM ZINC PLUS.
 - c. **<Insert manufacturer's name; product name or designation>.**
 2. Finish: **[Bright rolled] [Prewathered gray] [Prewathered black].**

2.2 UNDERLAYMENT MATERIALS

- A. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.
- B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- C. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 3. Products: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.

- d. Metal-Fab Manufacturing, LLC; MetShield.
- e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- f. **<Insert manufacturer's name; product name or designation>.**

D. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal[**or manufactured item**] unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal [**or manufactured item**].
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for [**Copper**] [**Zinc-Tin Alloy-Coated Copper**] Sheet: Copper, hardware bronze or Series 300 stainless steel.
 - 3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 5. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
 - 6. Fasteners for [**Zinc-Coated (Galvanized)**] [**Aluminum-Zinc Alloy-Coated**] Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
 - 7. Fasteners for Zinc Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Solder:
 - 1. For Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
 - 2. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
 - 3. For Zinc-Tin Alloy-Coated [**Stainless Steel**] [**Copper**]: ASTM B 32, 100 percent tin.
 - 4. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
 - 5. For Zinc: ASTM B 32, 40 percent tin and 60 percent lead with low antimony, as recommended by manufacturer.

- D. 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 wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric **[polyurethane]** **[polysulfide]** **[silicone]** polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Through-Wall Ribbed Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond. Manufacture through-wall flashing with **[snaplock receiver on exterior face to receive counterflashing]** **[interlocking counterflashing on exterior face, of same metal as reglet]**.
 - 1. Copper: **[10 oz.]** **<Insert weight>** minimum for fully concealed flashing; **[16 oz.]** **<Insert weight>** elsewhere.
 - a. Products: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) Cheney Flashing Company; Cheney Flashing (Dovetail).
 - 2) Cheney Flashing Company; Cheney Flashing (Sawtooth).
 - 3) Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
 - 4) Keystone Flashing Company, Inc.; Keystone Three-Way Interlocking Thruwall Flashing.
 - 5) Sandell Manufacturing Company, Inc.; Pre-Formed Metal Flashing.
 - 6) **<Insert manufacturer's name; product name or designation>**.
 - 2. Stainless Steel: **[0.016 inch]** **<Insert thickness>** thick.
 - a. Products: Subject to compliance with requirements, **[provide the following]** **[provide one of the following]** **[available products that may be incorporated into the Work include, but are not limited to, the following]**:
 - 1) Cheney Flashing Company; Cheney Flashing (Dovetail).

- 2) Cheney Flashing Company; Cheney Flashing (Sawtooth).
 - 3) Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
 - 4) Keystone Flashing Company, Inc.; Keystone Three-Way Interlocking Thruwall Flashing.
 - 5) Sandell Manufacturing Company, Inc.; Pre-Formed Metal Flashing.
 - 6) **<Insert manufacturer's name; product name or designation>.**
- B. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated [**with factory-mitered and -welded corners and junctions**] [**with interlocking counterflashing on exterior face, of same metal as reglet**].
1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. Cheney Flashing Company.
 - b. Fry Reglet Corporation.
 - c. Heckmann Building Products Inc.
 - d. Hickman, W. P. Company.
 - e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
 - f. Keystone Flashing Company, Inc.
 - g. National Sheet Metal Systems, Inc.
 - h. Sandell Manufacturing Company, Inc.
 - i. **<Insert manufacturer's name>.**
 3. Material: [**Stainless steel, 0.019 inch thick**] [**Copper, 16 oz./sq. ft.**] [**Aluminum, 0.024 inch thick**] [**Galvanized steel, 0.022 inch thick**].
 4. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 5. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
 6. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
 7. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 8. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
 9. Finish: [**Mill**] [**With manufacturer's standard color coating**] **<Insert finish>.**

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal 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.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 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.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual"[**and by FMG Loss Prevention Data Sheet 1-49**] for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.[**Rivet joints where necessary for strength.**]
- J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.[**Rivet joints where necessary for strength.**]
- K. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, **[gutter bead reinforcing bars,]** and gutter accessories from same metal as gutters.
1. Gutter Style: SMACNA designation **[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L]**.
 2. Expansion Joints: **[Lap type] [Butt type] [Butt type with cover plate] [Built in]**.
 3. Accessories: **[Continuous removable leaf screen with sheet metal frame and hardware cloth screen] [Wire ball downspout strainer] [Valley baffles]**.
 4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
 - a. Copper: **[16 oz./sq. ft.] <Insert weight>**.
 - b. Aluminum: **[0.032 inch] <Insert thickness>** thick.
 - c. Stainless Steel: **[0.016 inch] <Insert thickness>** thick.
 - d. Zinc-Tin Alloy-Coated Stainless Steel: **[0.015 inch] <Insert thickness>** thick.
 - e. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.] <Insert weight>**.
 - f. Galvanized Steel: **[0.022 inch] <Insert thickness>** thick.
 - g. Aluminum-Zinc Alloy-Coated Steel: **[0.022 inch] <Insert thickness>** thick.
 - h. Zinc: **[0.032 inch] [0.039 inch] <Insert thickness>** thick.
 5. Gutters with Girth 16 to 20 Inches: Fabricate from the following materials:
 - a. Copper: **[16 oz./sq. ft.] <Insert weight>**.
 - b. Aluminum: **[0.040 inch] <Insert thickness>** thick.
 - c. Stainless Steel: **[0.019 inch] <Insert thickness>** thick.
 - d. Zinc-Tin Alloy-Coated Stainless Steel: **[0.018 inch] <Insert thickness>** thick.
 - e. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.] <Insert weight>**.
 - f. Galvanized Steel: **[0.028 inch] <Insert thickness>** thick.
 - g. Aluminum-Zinc Alloy-Coated Steel: **[0.028 inch] <Insert thickness>** thick.
 - h. Zinc: **[0.039 inch] [0.048 inch] <Insert thickness>** thick.
 6. Gutters with Girth 21 to 25 Inches: Fabricate from the following materials:
 - a. Copper: **[20 oz./sq. ft.] <Insert weight>**.
 - b. Aluminum: **[0.050 inch] <Insert thickness>** thick.
 - c. Stainless Steel: **[0.025 inch] <Insert thickness>** thick.
 - d. Zinc-Tin Alloy-Coated Stainless Steel: **[0.024 inch] <Insert thickness>** thick.
 - e. Zinc-Tin Alloy-Coated Copper: **[20 oz./sq. ft.] <Insert weight>**.
 - f. Galvanized Steel: **[0.034 inch] <Insert thickness>** thick.
 - g. Aluminum-Zinc Alloy-Coated Steel: **[0.034 inch] <Insert thickness>** thick.
 - h. Zinc: **[0.048 inch] [0.059 inch] <Insert thickness>** thick.
 7. Gutters with Girth 26 to 30 Inches: Fabricate from the following materials:
 - a. Copper: **[24 oz./sq. ft.] <Insert weight>**.
 - b. Aluminum: **[0.063 inch] <Insert thickness>** thick.
 - c. Stainless Steel: **[0.031 inch] <Insert thickness>** thick.

- d. Zinc-Tin Alloy-Coated Copper: **[24 oz./sq. ft.] <Insert weight>**.
 - e. Galvanized Steel: **[0.040 inch] <Insert thickness>** thick.
 - f. Aluminum-Zinc Alloy-Coated Steel: **[0.040 inch] <Insert thickness>** thick.
8. Gutters with Girth 31 to 35 Inches: Fabricate from the following materials:
- a. Copper: **[24 oz./sq. ft.] <Insert weight>**.
 - b. Stainless Steel: **[0.038 inch] <Insert thickness>** thick.
 - c. Zinc-Tin Alloy-Coated Copper: **[25 oz./sq. ft.] <Insert weight>**.
 - d. Galvanized Steel: **[0.052 inch] <Insert thickness>** thick.
 - e. Aluminum-Zinc Alloy-Coated Steel: **[0.052 inch] <Insert thickness>** thick.
- B. Built-in Gutters: Fabricate to cross section indicated, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 96-inch- long sections. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.
1. Fabricate gutters with built-in expansion joints[**and gutter-end expansion joints at walls**].
 2. Accessories: **[Continuous removable leaf screen with sheet metal frame and hardware cloth screen] [Bronze wire ball downspout strainer] [Wire ball downspout strainer]**.
 3. Fabricate from the following materials:
 - a. Copper: **[16 oz./sq. ft.] <Insert weight>**.
 - b. Stainless Steel: **[0.016 inch] <Insert thickness>** thick.
 - c. Zinc-Tin Alloy-Coated Stainless Steel: **[0.015 inch] <Insert thickness>** thick.
 - d. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.] <Insert weight>**.
 - e. Zinc: **[0.032 inch] [0.039 inch] <Insert thickness>** thick.
- C. Downspouts: Fabricate **[round] [rectangular] [open-face]** downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
1. Fabricated Hanger Style: SMACNA figure designation **[1-35A] [1-35B] [1-35C] [1-35D] [1-35E] [1-35F] [1-35G] [1-35H] [1-35I] [1-35J]**.
 2. Manufactured Hanger Style: SMACNA figure designation **[1-34A] [1-34B] [1-34C] [1-34D] [1-34E]**.
 3. Hanger Style: **<Insert description>**.
 4. Fabricate from the following materials:
 - a. Copper: **[16 oz./sq. ft.] <Insert weight>**.
 - b. Aluminum: **[0.024 inch] <Insert thickness>** thick.
 - c. Stainless Steel: **[0.016 inch] <Insert thickness>** thick.
 - d. Zinc-Tin Alloy-Coated Stainless Steel: **[0.015 inch] <Insert thickness>** thick.
 - e. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.] <Insert weight>**.
 - f. Galvanized Steel: **[0.022 inch] <Insert thickness>** thick.
 - g. Aluminum-Zinc Alloy-Coated Steel: **[0.022 inch] <Insert thickness>** thick.
 - h. Zinc: **[0.032 inch] [0.039 inch] <Insert thickness>** thick.
- D. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or

tapered strip into field of roof.[**Fasten gravel guard angles to base of scupper.**] Fabricate from the following materials:

1. Copper: [16 oz./sq. ft.] <Insert weight>.
2. Aluminum: [0.032 inch] <Insert thickness> thick.
3. Stainless Steel: [0.019 inch] <Insert thickness> thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: [0.018 inch] <Insert thickness> thick.
5. Zinc-Tin Alloy-Coated Copper: [16 oz./sq. ft.] <Insert weight>.
6. Galvanized Steel: [0.028 inch] <Insert thickness> thick.
7. Aluminum-Zinc Alloy-Coated Steel: [0.028 inch] <Insert thickness> thick.
8. Zinc: [0.032 inch] [0.039 inch] <Insert thickness> thick.

E. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes[, **exterior flange trim,**] [and] [**built-in overflows**]. Fabricate from the following materials:

1. Copper: [16 oz./sq. ft.] <Insert weight>.
2. Aluminum: [0.032 inch] <Insert thickness> thick.
3. Stainless Steel: [0.016 inch] <Insert thickness> thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: [0.015 inch] <Insert thickness> thick.
5. Zinc-Tin Alloy-Coated Copper: [16 oz./sq. ft.] <Insert weight>.
6. Galvanized Steel: [0.028 inch] <Insert thickness> thick.
7. Aluminum-Zinc Alloy-Coated Steel: [0.028 inch] <Insert thickness> thick.
8. Zinc: [0.032 inch] [0.039 inch] <Insert thickness> thick.

F. Splash Pans: Fabricate from the following materials:

1. Copper: [16 oz./sq. ft.] <Insert weight>.
2. Aluminum: [0.040 inch] <Insert thickness> thick.
3. Stainless Steel: [0.019 inch] <Insert thickness> thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: [0.018 inch] <Insert thickness> thick.
5. Zinc-Tin Alloy-Coated Copper: [16 oz./sq. ft.] <Insert weight>.
6. Zinc: [0.032 inch] [0.039 inch] <Insert thickness> thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Edge Flashing (Gravel Stop)[**and Fascia Cap**]: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Furnish with 6-inch- wide, joint cover plates.

1. Joint Style: [**Lap, 4 inches wide**] [**Butt, with 12-inch- wide, concealed backup plate**] [**Butt, with 6-inch- wide, exposed cover plates**] [**Butt, with 12-inch- wide, concealed backup plate and 6-inch- wide, exposed cover plates**].
2. Fabricate with scuppers spaced [10 feet] <Insert spacing> apart, of dimensions required with 4-inch- wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
3. Fabricate from the following materials:
 - a. Copper: [20 oz./sq. ft.] <Insert weight>.
 - b. Aluminum: [0.050 inch] <Insert thickness> thick.
 - c. Stainless Steel: [0.019 inch] <Insert thickness> thick.

- d. Zinc-Tin Alloy-Coated Stainless Steel: **[0.018 inch]** <Insert thickness> thick.
 - e. Zinc-Tin Alloy-Coated Copper: **[20 oz./sq. ft.]** <Insert weight>.
 - f. Galvanized Steel: **[0.028 inch]** <Insert thickness> thick.
 - g. Aluminum-Zinc Alloy-Coated Steel: **[0.028 inch]** <Insert thickness> thick.
 - h. Zinc: **[0.048 inch]** **[0.059 inch]** <Insert thickness> thick.
- B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and **[drill elongated holes for fasteners on]** interior leg. Miter corners, seal, and solder or weld watertight.
- 1. Coping Profile: SMACNA figure designation **[3-4A]** **[3-4B]** **[3-4C]** **[3-4D]** **[3-4E]** **[3-4F]** **[3-4G]**.
 - 2. Joint Style: **[Butt, with 12-inch- wide, concealed backup plate]** **[Butt, with 6-inch- wide, exposed cover plates]** **[Butt, with 12-inch- wide, concealed backup plate and 6-inch- wide, exposed cover plates]**.
 - 3. Fabricate from the following materials:
 - a. Copper: **[24 oz./sq. ft.]** <Insert weight>.
 - b. Aluminum: **[0.050 inch]** <Insert thickness> thick.
 - c. Stainless Steel: **[0.025 inch]** <Insert thickness> thick.
 - d. Zinc-Tin Alloy-Coated Stainless Steel: **[0.024 inch]** <Insert thickness> thick.
 - e. Zinc-Tin Alloy-Coated Copper: **[24 oz./sq. ft.]** <Insert weight>.
 - f. Galvanized Steel: **[0.040 inch]** <Insert thickness> thick.
 - g. Aluminum-Zinc Alloy-Coated Steel: **[0.040 inch]** <Insert thickness> thick.
 - h. Zinc: **[0.048 inch]** **[0.059 inch]** <Insert thickness> thick.
- C. **[Roof]** **[and]** **[Roof to Wall Transition]** **[Roof to Roof Edge Flashing (Gravel Stop) Transition]** **[Roof to Roof Edge Flashing (Gravel Stop) and Fascia Cap Transition]**
Expansion-Joint Cover: Fabricate from the following materials:
- 1. Copper: **[16 oz./sq. ft.]** <Insert weight>.
 - 2. Aluminum: **[0.050 inch]** <Insert thickness> thick.
 - 3. Stainless Steel: **[0.025 inch]** <Insert thickness> thick.
 - 4. Zinc-Tin Alloy-Coated Stainless Steel: **[0.024 inch]** <Insert thickness> thick.
 - 5. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.]** <Insert weight>.
 - 6. Galvanized Steel: **[0.034 inch]** <Insert thickness> thick.
 - 7. Aluminum-Zinc Alloy-Coated Steel: **[0.034 inch]** <Insert thickness> thick.
 - 8. Zinc: **[0.032 inch]** **[0.039 inch]** <Insert thickness> thick.
- D. Base Flashing: Fabricate from the following materials:
- 1. Copper: **[20 oz./sq. ft.]** <Insert weight>.
 - 2. Aluminum: **[0.040 inch]** <Insert thickness> thick.
 - 3. Stainless Steel: **[0.019 inch]** <Insert thickness> thick.
 - 4. Zinc-Tin Alloy-Coated Stainless Steel: **[0.018 inch]** <Insert thickness> thick.
 - 5. Zinc-Tin Alloy-Coated Copper: **[20 oz./sq. ft.]** <Insert weight>.
 - 6. Galvanized Steel: **[0.028 inch]** <Insert thickness> thick.
 - 7. Aluminum-Zinc Alloy-Coated Steel: **[0.028 inch]** <Insert thickness> thick.
 - 8. Zinc: **[0.032 inch]** **[0.039 inch]** <Insert thickness> thick.

E. Counterflashing: Fabricate from the following materials:

1. Copper: **[16 oz./sq. ft.] <Insert weight>**.
2. Aluminum: **[0.032 inch] <Insert thickness>** thick.
3. Stainless Steel: **[0.019 inch] <Insert thickness>** thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: **[0.018 inch] <Insert thickness>** thick.
5. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.] <Insert weight>**.
6. Galvanized Steel: **[0.022 inch] <Insert thickness>** thick.
7. Aluminum-Zinc Alloy-Coated Steel: **[0.022 inch] <Insert thickness>** thick.
8. Zinc: **[0.032 inch] [0.039 inch] <Insert thickness>** thick.

F. Flashing Receivers: Fabricate from the following materials:

1. Copper: **[16 oz./sq. ft.] <Insert weight>**.
2. Aluminum: **[0.032 inch] <Insert thickness>** thick.
3. Stainless Steel: **[0.016 inch] <Insert thickness>** thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: **[0.015 inch] <Insert thickness>** thick.
5. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.] <Insert weight>**.
6. Galvanized Steel: **[0.022 inch] <Insert thickness>** thick.
7. Aluminum-Zinc Alloy-Coated Steel: **[0.022 inch] <Insert thickness>** thick.
8. Zinc: **[0.032 inch] [0.039 inch] <Insert thickness>** thick.

G. Roof-Penetration Flashing: Fabricate from the following materials:

1. Copper: **[16 oz./sq. ft.] <Insert weight>**.
2. Stainless Steel: **[0.019 inch] <Insert thickness>** thick.
3. Zinc-Tin Alloy-Coated Stainless Steel: **[0.018 inch] <Insert thickness>** thick.
4. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.] <Insert weight>**.
5. Galvanized Steel: **[0.028 inch] <Insert thickness>** thick.
6. Aluminum-Zinc Alloy-Coated Steel: **[0.028 inch] <Insert thickness>** thick.
7. Zinc: **[0.032 inch] [0.039 inch] <Insert thickness>** thick.

H. Roof-Drain Flashing: Fabricate from the following materials:

1. Copper: **[12 oz./sq. ft.] <Insert weight>**.
2. Stainless Steel: **[0.016 inch] <Insert thickness>** thick.
3. Zinc-Tin Alloy-Coated Stainless Steel: **[0.015 inch] <Insert thickness>** thick.

2.8 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:

1. Copper: **[16 oz./sq. ft.] <Insert weight>**.
2. Aluminum: **[0.032 inch] <Insert thickness>** thick.
3. Stainless Steel: **[0.016 inch] <Insert thickness>** thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: **[0.015 inch] <Insert thickness>** thick.
5. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.] <Insert weight>**.
6. Galvanized Steel: **[0.022 inch] <Insert thickness>** thick.
7. Aluminum-Zinc Alloy-Coated Steel: **[0.022 inch] <Insert thickness>** thick.
8. Zinc: **[0.032 inch] [0.039 inch] <Insert thickness>** thick.

- B. Valley Flashing: Fabricate from the following materials:
1. Copper: [16 oz./sq. ft.] <Insert weight>.
 2. Stainless Steel: [0.019 inch] <Insert thickness> thick.
 3. Zinc-Tin Alloy-Coated Stainless Steel: [0.018 inch] <Insert thickness> thick.
 4. Zinc-Tin Alloy-Coated Copper: [16 oz./sq. ft.] <Insert weight>.
 5. Galvanized Steel: [0.028 inch] <Insert thickness> thick.
 6. Aluminum-Zinc Alloy-Coated Steel: [0.028 inch] <Insert thickness> thick.
 7. Zinc: [0.032 inch] [0.039 inch] <Insert thickness> thick.
- C. Drip Edges: Fabricate from the following materials:
1. Copper: [16 oz./sq. ft.] <Insert weight>.
 2. Aluminum: [0.032 inch] <Insert thickness> thick.
 3. Stainless Steel: [0.016 inch] <Insert thickness> thick.
 4. Zinc-Tin Alloy-Coated Stainless Steel: [0.015 inch] <Insert thickness> thick.
 5. Zinc-Tin Alloy-Coated Copper: [16 oz./sq. ft.] <Insert weight>.
 6. Galvanized Steel: [0.022 inch] <Insert thickness> thick.
 7. Aluminum-Zinc Alloy-Coated Steel: [0.022 inch] <Insert thickness> thick.
 8. Zinc: [0.032 inch] [0.039 inch] <Insert thickness> thick.
- D. Eave, Rake[, **Ridge, and Hip**] Flashing: Fabricate from the following materials:
1. Copper: [16 oz./sq. ft.] <Insert weight>.
 2. Aluminum: [0.032 inch] <Insert thickness> thick.
 3. Stainless Steel: [0.016 inch] <Insert thickness> thick.
 4. Zinc-Tin Alloy-Coated Stainless Steel: [0.015 inch] <Insert thickness> thick.
 5. Zinc-Tin Alloy-Coated Copper: [16 oz./sq. ft.] <Insert weight>.
 6. Galvanized Steel: [0.022 inch] <Insert thickness> thick.
 7. Aluminum-Zinc Alloy-Coated Steel: [0.022 inch] <Insert thickness> thick.
 8. Zinc: [0.032 inch] [0.039 inch] <Insert thickness> thick.
- E. Counterflashing: Fabricate from the following materials:
1. Copper: [16 oz./sq. ft.] <Insert weight>.
 2. Aluminum: [0.032 inch] <Insert thickness> thick.
 3. Stainless Steel: [0.019 inch] <Insert thickness> thick.
 4. Zinc-Tin Alloy-Coated Stainless Steel: [0.018 inch] <Insert thickness> thick.
 5. Zinc-Tin Alloy-Coated Copper: [16 oz./sq. ft.] <Insert weight>.
 6. Galvanized Steel: [0.022 inch] <Insert thickness> thick.
 7. Aluminum-Zinc Alloy-Coated Steel: [0.022 inch] <Insert thickness> thick.
 8. Zinc: [0.032 inch] [0.039 inch] <Insert thickness> thick.
- F. Flashing Receivers: Fabricate from the following materials:
1. Copper: [16 oz./sq. ft.] <Insert weight>.
 2. Aluminum: [0.032 inch] <Insert thickness> thick.
 3. Stainless Steel: [0.016 inch] <Insert thickness> thick.
 4. Zinc-Tin Alloy-Coated Stainless Steel: [0.015 inch] <Insert thickness> thick.
 5. Zinc-Tin Alloy-Coated Copper: [16 oz./sq. ft.] <Insert weight>.
 6. Galvanized Steel: [0.022 inch] <Insert thickness> thick.

7. Aluminum-Zinc Alloy-Coated Steel: **[0.022 inch]** <Insert thickness> thick.
8. Zinc: **[0.032 inch]** **[0.039 inch]** <Insert thickness> thick.

G. Roof-Penetration Flashing: Fabricate from the following materials:

1. Copper: **[16 oz./sq. ft.]** <Insert weight>.
2. Stainless Steel: **[0.019 inch]** <Insert thickness> thick.
3. Zinc-Tin Alloy-Coated Stainless Steel: **[0.018 inch]** <Insert thickness> thick.
4. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.]** <Insert weight>.
5. Galvanized Steel: **[0.028 inch]** <Insert thickness> thick.
6. Aluminum-Zinc Alloy-Coated Steel: **[0.028 inch]** <Insert thickness> thick.
7. Zinc: **[0.032 inch]** **[0.039 inch]** <Insert thickness> thick.

2.9 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous. Fabricate from the following materials:

1. Copper: **[16 oz./sq. ft.]** <Insert weight>.
2. Stainless Steel: **[0.016 inch]** <Insert thickness> thick.
3. Zinc-Tin Alloy-Coated Stainless Steel: **[0.015 inch]** <Insert thickness> thick.
4. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.]** <Insert weight>.
5. Zinc: **[0.032 inch]** **[0.039 inch]** <Insert thickness> thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, **[jamb,]** and similar flashings to extend **[4 inches]** <Insert extension> beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:

1. Copper: **[16 oz./sq. ft.]** <Insert weight>.
2. Aluminum: **[0.032 inch]** <Insert thickness> thick.
3. Stainless Steel: **[0.016 inch]** <Insert thickness> thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: **[0.015 inch]** <Insert thickness> thick.
5. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.]** <Insert weight>.
6. Galvanized Steel: **[0.022 inch]** <Insert thickness> thick.
7. Aluminum-Zinc Alloy-Coated Steel: **[0.022 inch]** <Insert thickness> thick.
8. Zinc: **[0.032 inch]** **[0.039 inch]** <Insert thickness> thick.

C. Wall Expansion-Joint Cover: Fabricate from the following materials:

1. Copper: **[16 oz./sq. ft.]** <Insert weight>.
2. Aluminum: **[0.040 inch]** <Insert thickness> thick.
3. Stainless Steel: **[0.019 inch]** <Insert thickness> thick.
4. Zinc-Tin Alloy-Coated Stainless Steel: **[0.018 inch]** <Insert thickness> thick.
5. Zinc-Tin Alloy-Coated Copper: **[16 oz./sq. ft.]** <Insert weight>.
6. Galvanized Steel: **[0.028 inch]** <Insert thickness> thick.
7. Aluminum-Zinc Alloy-Coated Steel: **[0.028 inch]** <Insert thickness> thick.
8. Zinc: **[0.032 inch]** **[0.039 inch]** <Insert thickness> thick.

2.10 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 - 1. Copper: [16 oz./sq. ft.] <Insert weight>.
 - 2. Stainless Steel: [0.019 inch] <Insert thickness> thick.
 - 3. Zinc-Tin Alloy-Coated Stainless Steel: [0.018 inch] <Insert thickness> thick.
 - 4. Zinc-Tin Alloy-Coated Copper: [16 oz./sq. ft.] <Insert weight>.
 - 5. Galvanized Steel: [0.028 inch] <Insert thickness> thick.
 - 6. Aluminum-Zinc Alloy-Coated Steel: [0.028 inch] <Insert thickness> thick.
- B. Overhead-Piping Safety Pans: Fabricate from the following materials:
 - 1. Copper: [24 oz./sq. ft.] <Insert weight>.
 - 2. Stainless Steel: [0.025 inch] <Insert thickness> thick.
 - 3. Zinc-Tin Alloy-Coated Stainless Steel: [0.024 inch] <Insert thickness> thick.
 - 4. Zinc-Tin Alloy-Coated Copper: [24 oz./sq. ft.] <Insert weight>.
 - 5. Galvanized Steel: [0.040 inch] <Insert thickness> thick.
 - 6. Aluminum-Zinc Alloy-Coated Steel: [0.040 inch] <Insert thickness> thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.
- C. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

- D. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. 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 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. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 5. Install sealant tape where indicated.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of **[uncoated aluminum] [and] [stainless-steel]** sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **[10 feet] <Insert dimension>** with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate **[wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws] [metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance] <Insert size requirement>**.
- E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, 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.
 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- F. 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, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder **[metallic-coated steel] [and] [aluminum]** sheet.
 2. Pre-tinning is not required for **[zinc-tin alloy-coated stainless steel] [and] [zinc-tin alloy-coated copper]**.
 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.
 4. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
 5. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.
- G. Rivets: Rivet joints in **[uncoated aluminum] [zinc]** where indicated and where necessary for strength.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored **[gutter brackets] [straps] [twisted straps]** spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
 2. Loosely lock straps to front gutter bead and anchor to roof deck.
 3. Anchor and loosely lock back edge of gutter to continuous **[cleat] [eave or apron flashing]**.
 4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than **[24 inches] <Insert dimension>** apart.
 5. Anchor gutter with spikes and ferrules spaced not more than **[24 inches] [30 inches] <Insert dimension>** apart.
 6. Install gutter with expansion joints at locations indicated, but not exceeding, **[50 feet] <Insert dimension>** apart. Install expansion-joint caps.
 7. Install continuous gutter screens on gutters with noncorrosive fasteners, **[removable] [hinged to swing open]** for cleaning gutters.

- C. Built-in Gutters: Join sections with riveted and soldered or lapped joints sealed with sealant. Provide for thermal expansion. Slope to downspouts. Provide end closures and seal watertight with sealant.
1. Install felt underlayment layer in built-in gutter trough and extend to drip edge at eaves and under felt underlayment on roof sheathing. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with roofing nails. Install slip sheet over felt underlayment.
 2. Anchor and loosely lock back edge of gutter to continuous **[cleat] [eave or apron flashing]**.
 3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than **[24 inches] <Insert dimension>** apart.
 4. Install gutter with expansion joints at locations indicated, but not exceeding, **[50 feet] <Insert dimension>** apart. Install expansion-joint caps.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
 2. Provide elbows at base of downspout to direct water away from building.
 3. Connect downspouts to underground drainage system indicated.
- E. Splash Pans: Install where downspouts discharge on **[low-slope roofs] <Insert surface>**. Set in **[asphalt roofing cement] [elastomeric sealant]** compatible with **[roofing membrane] <Insert material>**.
- F. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
1. Anchor scupper closure trim flange to exterior wall and **[solder] [or] [seal with elastomeric sealant]** to scupper.
 2. Loosely lock front edge of scupper with conductor head.
 3. **[Solder] [or] [seal with elastomeric sealant]** exterior wall scupper flanges into back of conductor head.
- G. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below **[scupper] [gutter]** discharge.
- H. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements[, **sheet metal manufacturer's written installation instructions,**] and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at [**staggered 3-inch**] <Insert spacing> centers.
- C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at [**24-inch**] [**16-inch**] <Insert spacing> centers.
- D. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.
 - 1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at [**24-inch**] [**16-inch**] <Insert spacing> centers.
 - 2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at [**24-inch**] <Insert spacing> centers.
- E. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
 - 1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at [**24-inch**] [**16-inch**] <Insert spacing> centers.
 - 2. Anchor interior leg of coping with screw fasteners and washers at [**24-inch**] [**20-inch**] <Insert spacing> centers.
- F. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- G. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of [**snap-in installation and sealant or lead wedges and sealant**] [**interlocking folded seam or blind rivets and sealant**] [**anchor and washer at 36-inch centers**].
- H. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with [**elastomeric**] [**butyl**] sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section "[**Unit Masonry**] [**Stone Masonry**]."

- C. Reglets: Installation of reglets is specified in [**Division 03 Section "Cast-in-Place Concrete"** [**Division 04 Section "Unit Masonry"**]."
- D. Opening Flashings in Frame Construction: Install continuous head, sill,[**jamb,**] and similar flashings to extend [**4 inches**] <**Insert extension**> beyond wall openings.

3.7 MISCELLANEOUS FLASHING INSTALLATION

- A. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.
- B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 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.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.9 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 flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00