

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Flashing and sheet metal including but not limited to the assemblies listed below along with supplementary items necessary for installation:

1. Formed wall and embedded flashing.
2. Formed equipment support flashing.
3. Formed overhead-piping safety pans.
4. Formed pipe penetrations not covered under Section 'Roof Accessories'.

- B. Related Work:

1. Refer to Owner Building Enclosure Commissioning Plan for Field Observations and Performance Testing Activities. Section 01 91 15 Building Enclosure Commissioning (BECx).
2. Refer to Division 06, Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
3. Refer to Division 07, Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, vents, and other manufactured roof accessory units.

1.2 ACTION SUBMITTALS

- A. Schedule and Coordinate submittal and shop drawing review with Building Enclosure Commission Provider (BECxP) for OPR verification. Primary submittal approval is AOR responsibility.

- B. Product Data: Manufacturer's technical literature for each product and system indicated.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
2. Include underlayment materials and sealants.

- C. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:
 - a. Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
 - b. Bio-based Materials: For bio-based products and materials other than wood, submit documentation of product data and testing results in compliance with LEED requirements.
 - c. Wood Products: Submit documentation of Forest Stewardship Council or USGBC equivalent certification.
 - d. Materials Reuse: For products that are salvaged, refurbished, or reused, include a statement indicating costs for each product.
 - e. Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.
 - 1) Include statement indicating costs for each product having recycled content.

- f. Regional Materials: For products that are required to comply with requirements for regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.
 - 1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.
- 2. Indoor Environmental Quality, Low Emitting Materials: Building Products must be tested and compliant with the California Department of Public-Health (CDPH) Standard Method V1.1-2010 or v1.2 2017, using the applicable exposure scenario.
 - a. For paints, and coatings, wet applied, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure for Architectural Coatings or the South Coast Air Quality Management District (SCAQMD) Rule 1113-2011.
 - b. Adhesives and Sealants: For wet applied on-site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005 and rule amendment date of January 7, 2005.
 - c. Alternative tests for VOC above include ASTM D2369-10; ISO 11890 part 1; ASTM D6886-03; or ISO 11890-2.
 - d. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants
 - e. Composite Wood: Submit documentation showing that wood used in the project has low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low emitting formaldehyde (ULEF) resins or no added formaldehyde resins.
- D. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Embedded Flashing: Large-scale details for each element of flashing system showing layout, profiles, methods of joining, and anchorage details; including lintel units, shelf units, corner units, end dam units, conditions showing interface and relationship to adjacent materials, and other special applications.
 - 8. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 - 9. Include details of roof-penetration flashing.
 - 10. Include details of special conditions.
 - 11. Include details of connections to adjoining work.
 - a. Include isometric details of saddles, end dams, and other complex flashing conditions.
- E. Samples for Verification Purposes: Submit for items listed below; provide samples made from 12 in (300 mm) lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1. Sheet Metal Flashing: 12 in (300 mm) 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 in (300 mm) long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Project Acceptance Document: Certification by the manufacturer that its product(s) are approved, acceptable, suitable for use in specific locations, for specific details, and for applications indicated, specified, or required, and that a warranty will be issued.
 1. Provide sealant and underlayment manufacturers certification that their products are compatible with each other, including adhesion.
- B. Fabrication Engineering and Design Data Submittal: Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation; test reports are not acceptable substitute for calculations.
- C. Product Test Reports: Written reports based on evaluation of comprehensive tests performed by qualified testing agency indicating that each product complies with requirements.
 1. Submit FM Approvals Listing in "RoofNav" for approved for windstorm classification. Identify materials with name of fabricator and design approved by FM Approvals.
- D. Warranty:
 1. Provide manufacturer's written warranty covering materials and installation (labor) stating obligations, remedies, limitations and exclusions.
- E. Sustainable Design Submittals:
 1. Building Product Disclosure and Optimization - Environmental Product Declarations
 - a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.
 2. Building Product Disclosure and Optimization - Material Ingredients
 - a. Material Ingredient Reporting: Submit documentation confirming chemical inventory of products to at least 0.1 % (1000ppm) with at least one of the following:
 - 1) Submit published manufacturer inventory of ingredients identified by name and Chemical Abstract Service Registration Number (CASRN)
 - 2) Submit documentation that product has been certified as Cradle-to-Cradle v3 at the Bronze Level or better
 - 3) Submit Declare product label indicating that all ingredients have been disclosed down to 1000 ppm or designated as Red List Free or Declared
 - 4) Living Product Challenge
 - 5) Product Lens Certification
 - 6) USGBC approved program.

- b. Material Ingredient Optimization: Submit documentation confirming chemical inventory of products to at least 0.01 % (100ppm) and/or that has a compliant material ingredient optimization report with at least one of the following:
 - 1) Submit GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
 - 2) Submit third-party verified documentation that product has been certified as Cradle-to-Cradle v3 at the Bronze Level or better
 - 3) Submit third-party verified Cradle to Cradle v3 Material Health certificate at the Bronze Level or better
 - 4) Submit third-party verified Declare product label indicating that all ingredients have been disclosed down to 100 ppm
 - 5) Submit third-party verified documentation that product is Living Product Challenge certified with a Red List Free or LBC Red List Free Declare label.
 - 6) Submit documentation that product has a manufacturer prepared action plan with material inventory to at least 1000 ppm.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer/Fabricator Qualifications: Manufacturer/shop-fabricator with not less than 5 years' experience with successful production of products and systems similar to scope of this Project, with a record of successful in-service performance and completion of projects for a period of not less than 5 years, and with sufficient production capability, facilities, and personnel to produce required Work.
- B. Installer Qualifications:
 - 1. Experience: Installer's personnel with not less than 5 years of experience in the successful performance of Work similar to scope of this Project.
 - 2. Supervision: Installer shall maintain a competent supervisor at Project while the Work is in progress, and who has not less than 5 years of experience installing products and systems similar to scope of this Project.
- C. Mock-ups: Prior to fabrication and installation, build mock-up for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up using materials indicated for the completed Work.
 - 1. Build mock-up in the location and of the size indicated or, if not indicated, as directed by Architect. Contractor shall provide structural support framework.
 - a. Show typical components, attachments to building structure, and requirements of installation.
 - 2. Notify Architect seven days in advance of the dates and times when mock-up will be installed.
 - 3. Obtain Architect's acceptance of mock-ups before starting fabrication or installation.
 - 4. Acceptance of mock-ups does not constitute acceptance of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically noted by Contractor and accepted by Architect in writing.

5. Demolish and remove mock-ups when directed by Architect unless accepted to become part of the completed Work.

1.6 PRE-INSTALLATION CONFERENCE

- A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.
 1. Participants:
 - a. Architect.
 - b. Contractor, including superintendent.
 - c. Installer, including project manager and supervisor.
 - d. If requested, Manufacturer's qualified technical representative.
 - e. Installers of other construction interfaced with Work.
 2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:
 - a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
 - b. Review Contract Document requirements.
 - c. Review approved submittals.
 - d. Review inspection and testing requirements.
 - e. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.
 3. Record discussions, including decisions and agreements, and prepare report.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. 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 materials and fabrications away from uncured concrete and masonry.
- D. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit flashing and sheet metal work to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Where products and systems are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate installation of products and systems with interfacing and adjoining construction to provide a successful installation without failure.
- B. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- C. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Installer's Warranty: Furnish installer's written warranty signed by an authorized representative using installer's standard form agreeing to repair or replace components of all sheet metal flashing assemblies that exhibit defects in materials or workmanship within specified warranty period. "Defects" is defined to include, but not limited to, deterioration or failure to perform as required.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Special Finish Warranty, Factory-Applied Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessory metal that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

- A. Available Manufacturers and Products: Subject to compliance with requirements of Contract Documents as judged by the Architect, manufacturers offering products that may be incorporated into the Work include, but are not limited to, those listed.
 - 1. Manufacturers:
 - a. Cheney Flashing Company.
 - b. Fry Reglet Corporation.
 - c. OMG Edge Systems.
 - d. Keystone Flashing Company, Inc.

2.2 MATERIALS, GENERAL

- A. Single Source Responsibility: Furnish each type of product from single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

2.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of products and systems representing those indicated for this Project, without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure.
 - 2. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Material Compatibility: Provide flashing and sheet metal materials that are compatible with one another and specified roofing system under conditions of service and application required, as demonstrated by manufacturer based on testing and field experience.
- C. Fabrication Engineering and Design Data Engineering: Installed sheet metal flashing materials and fabrications shall withstand loads within limits of allowable working stresses of the materials involved under conditions indicated, including but not limited to, requirements established by authorities having jurisdiction and applicable building codes.
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Loads: As indicated on Drawings.
- D. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- E. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: Refer to Structural Loads.
- F. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification. Identify materials with name of fabricator and design approved by FM Approvals.
 - 1. Class: Match FM Approvals classification for roofing system.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- H. Low-Emitting Materials:
 - 1. Architectural paints and coatings wet-applied inside the weather-proofing system must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
 - 2. All paints and coatings wet-applied inside the weather-proofing system must have VOC content in compliance with the applicable VOC limits (g/L) found in tables in Division 01 Section 01 81 13 "Sustainable Design Requirements - LEED v4 BD+C."
 - 3. Adhesives and Sealants wet-applied inside the weather-proofing system must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.

4. All adhesives and sealants wet-applied inside the weather-proofing system must have VOC content in compliance with the applicable VOC limits (g/L) found in tables in Division 01 Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C."

2.4 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum (Prefinished Sheet Metal): Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:
 1. Factory-Painted Aluminum Sheet (**FL-02**): ASTM B 209, 3003-H14, with a minimum thickness as specified.
 2. Thickness: Unless otherwise indicated, 0.040-inch up to 2-inches of exposure, and 0.050-inch greater than 2-inches of exposure.
 3. Finish:
 - a. Exposed to view: PPG Duranar Sunstorm, 2-coat, post painted fluoropolymer thermal setting enamel containing Kynar 500 resin, meeting requirements of AAMA 2605, minimum thickness 2.4 mil. Provide barrier coat as required.
 - 1) Color: As selected by Architect from manufacturer's full range of solid and mica colors.
- C. Stainless-Steel Sheet (**FL-01**): ASTM A 240/A 240M or ASTM A 666, Type 316-304, dead soft, fully annealed; with smooth, flat surface.
 1. Finish: 2D (dull, cold rolled).
 2. Locations:
 - a. Hidden from view
 - b. As indicated on drawings

2.5 UNDERLAYMENT MATERIALS

- A. Material Compatibility: Provide underlayment materials that are compatible with substrates and specified roofing system under conditions of service and application required, as demonstrated by manufacturer based on testing and field experience.
- B. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 60 mils (1.5 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.
 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.
 3. SBS-Modified Asphalt Adhesive based Manufacturers and Products:
 - a. Owens Corning; WeatherLock Metal High Temperature Underlayment.
 4. Primer: Provided by underlayment manufacturer.
 5. Underlayment Sealing Tape: Provided by underlayment manufacturer.
 6. Sealant: Approved by underlayment manufacturer, compatible with both adhesive and facer of underlayment material.

- C. Slip Sheet: If recommended by manufacturer to separate sheet metal from underlayment; rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.6 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, stainless steel draw bands, solid shims and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Manufacturer's recommended 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. Provide metal-backed neoprene sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 3. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel.
- C. Solder:
 - 1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Rubberized-Asphalt Flexible Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 in (1.02 mm).
 - 1. Manufacturers and Products:
 - a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - b. Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
 - c. GCP Applied Technologies; Perm-A-Barrier Wall Flashing.
 - d. Heckmann Building Products, Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - e. Hohmann & Barnard, Inc.; Textroflash.
 - f. W.R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - g. Polyguard Products, Inc.; Polyguard 400.
 - 2. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- E. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 in (12 mm) wide and 1/8 in (3 mm) thick.
- F. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- G. Sealant for Use at Concealed Joints: Sealant shall be compatible with underlayment materials at interfaces. Contractor's option, one of the following:
1. Butyl: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
 2. Silicone: ASTM C 920, single-component, neutral cure silicone sealant.
 - a. Basis of Design: Dow Corning; 758 Silicone Weather Barrier Sealant.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, or cold-applied asphalt emulsion complying with ASTM D 1187; compounded for 15 mils (0.4 mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.7 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 2. 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.
 3. Obtain field measurements for accurate fit before shop fabrication.
 4. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
 6. Provide one-piece, watertight saddles at corners, ends and transitions between flashing profiles. Saddles shall have 4-inch flanges and seams shall be mechanically fastened. Uncoated metals shall be fully soldered watertight.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 in in 20 ft (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8 in (3 mm) offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 ft (3 m) with no joints within 24 in (600 mm) of corner or intersection.
- D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

- G. Soldered Seams - Unfinished or Concealed/Embedded Metals: Fabricate nonmoving seams with flat-lock seams except at corners. Rivet soldered joints for strength and solder over rivets. Solder shall flow through and fill the joint.
 - 1. Corners: Shop fabricate, factory mitered corners with continuously welded or soldered seams. Fabricate corners with no joints within 24 in (600 mm) of corner or intersection.
- H. Sealant Seams - Prefinished Metals: Fabricate nonmoving seams with flat-lock seams except at corners. Form seams and seal with elastomeric sealant. Rivet joints where necessary for strength.
- I. Corners: Shop fabricate, factory mitered corners. Form seams and seal with elastomeric sealant. Fabricate corners with no joints within 24 in (600 mm) of corner or intersection.
- J. Do not use graphite pencils to mark metal surfaces.

2.8 SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.
 - 1. Fabricate from the Following Materials, minimum thickness as indicated unless required otherwise to meet performance requirements.
 - a. Aluminum-Zinc Alloy-Coated Steel, Prefinished: 0.028 in (0.7 mm) thick.
 - 2. Corners: Factory mitered, mechanically clinched and sealed or soldered watertight.
 - 3. Joints: Lapped 4-inches, double seal with sealant.
 - 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. 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.
 - 6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 - 7. 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's lower edge.
 - 8. Finish: With manufacturer's standard color coating, unless indicated otherwise.

2.9 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Flashing General:
 - 1. Aluminum-Zinc Alloy-Coated Steel, Prefinished: 0.028 in (0.7 mm) (24 gauge) thick.
- B. Counterflashing: Manufactured units of heights to overlap top edges of base flashings by 4 in (100 mm) and in lengths not exceeding 12 ft (3.6 m) designed to snap into through-wall-flashing receiver and compress against base flashings with joints lapped. Shop fabricate interior and

exterior corners. Fabricate from the following materials, minimum thickness as indicated unless required otherwise to meet performance requirements.

1. Aluminum-Zinc Alloy-Coated Steel, Prefinished: 0.028 in (0.7 mm) thick.
2. Corners: Factory mitered and mechanically clinched and sealed or soldered watertight.
3. Joints: Lapped 4-inches, double seal with sealant.

- a. Offset counter-flashing joints 6-inches from flashing receiver joints.

C. Flashing Receivers: Fabricate from same materials as counterflashing.

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

1. Aluminum-Zinc Alloy-Coated Steel, Prefinished: 0.028 in (0.7 mm) thick.

2.10 EMBEDDED FLASHING FABRICATIONS

A. Fabricate continuous flashings in sections 8 ft (2.4 m) long minimum, but not exceeding 12 ft (3.6 m). Provide splice plates at joints of formed, smooth metal flashing.

1. Fabricate from the following materials:

- a. Stainless Steel: 0.025 in (0.64 mm) thick.
2. Shop form flashing on a bending brake.
3. Shape, trim and hand seam on bench as far as practical with proper tools.
4. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.
5. Form materials to shape indicated with straight lines, sharp angles and smooth curves.
6. Fold and hem exposed edges of flashings.

B. Flashing Joinery: Fabricate interior and exterior corners, intersections, and complex flashing conditions in shop, rather than in field, with properly folded, constructed and mechanically fastened continuous soldered joints. Field fabricated units are not permitted and will not be allowed

2.11 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel, Prefinished: 0.028 in (0.7 mm) thick.

B. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Stainless Steel: 0.025 in (0.64 mm) thick.
2. Aluminum-Zinc Alloy-Coated Steel, Prefinished: 0.040 in (1.0 mm) thick.

C. Miscellaneous Flashings:

1. Fabricate to cross section indicated with clips and accessories required for secure watertight installation. Meet recommendations of SMACNA for fabrication details and metal thicknesses.
2. Not-Exposed to Public View: Fabricate from the following materials:
 - a. Aluminum-Zinc Alloy-Coated Steel, Prefinished: 0.028 in (0.7 mm) thick.

3. Concealed By other Construction: Fabricate from the following materials:
 - a. Stainless Steel: 0.025 in (0.64 mm) thick.

2.12 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Acceptance of Surfaces and Conditions: Examine substrates to receive products and systems and associated work for compliance with requirements and other conditions affecting performance. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting work within a particular area will be construed as acceptance of surface conditions.
 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.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

3.2 INSTALLATION, GENERAL

- A. Installation Quality Standards: In addition to standards listed elsewhere, perform Work according to following, unless otherwise specified:
 1. Respective manufacturer's written installation instructions.
 2. Accepted submittals.
 3. Contract Documents.
- B. Pitch Pockets (aka Pitch Pans) at Roof Penetrations: Pitch pockets (aka pitch pans) at roofing penetrations are not allowed and will be considered non-conforming work. Refer to the drawings for allowable roof penetration details.

3.3 PREPARATION

- A. General: Comply with manufacturer's instructions, recommendations, and specifications for cleaning and surface preparation. Surfaces shall have no defects, contaminants, or errors which would result in poor or potentially defective installation or would cause latent defects in Work.

3.4 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment:

1. Install self-adhering sheet underlayment, wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 in (150 mm) staggered 24 in (600 mm) between courses.
5. Overlap side edges not less than 3-1/2 in (87 mm).
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

B. If recommended by manufacturer, apply slip sheet, wrinkle free, before installing sheet metal flashing and trim at horizontal applications where sheet metal will remain exposed.

1. Install in shingle fashion to shed water.
2. Lap joints not less than 4 inches (100 mm).

3.5 INSTALLATION OF SHEET METAL FLASHING AND TRIM

A. General: Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - a. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. 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.
5. Install continuous cleats with fasteners spaced not more than 12 in (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
6. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
7. Torch cutting of sheet metal flashing and trim is not permitted.
8. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

3. Asphalt Roofing Cement: Bed flanges in thick coat of asphalt roofing cement where required by manufacturer of sheet metal flashing materials and fabrications for waterproof performance.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. When ambient temperature at time of installation is between 40 deg F and 70 deg F (4 deg C and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
 2. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
 3. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- 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. Sealant Joints: Seal joints as required for watertight construction.
1. Use sealant-filled joints at lap joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is 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.
 - 1) 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 Section 07 92 00 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pre-tin edges of sheets with solder to width of 1-1/2 in (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.
 2. Do not solder metallic-coated steel sheet.
 3. Do not use torches for soldering.
 4. Heat surfaces to receive solder, and flow solder into joint.
 - a. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 5. Mechanically fasten soldered joints.
 6. Stainless-Steel Soldering:
 - a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
 - b. Promptly remove acid flux residue from metal after tinning and soldering.
 - c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- H. Rivets: Rivet joints in uncoated metals.

3.6 INSTALLATION OF ROOF FLASHING

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
 - 1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
 - 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Pipe or Post Counterflashing:
 - 1. Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 in (100 mm) over base flashing. Install stainless-steel draw band and tighten.
 - 2. Single pipe and conduit penetrations shall be flashed to the roofing system with roofing system manufacturer approved penetration materials and details.
 - 3. Multi-pipe and conduit penetrations shall be through covered metal pipe enclosures similar to SMACNA Figure 4-15A.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 - 2. Extend counterflashing 4 in (100 mm) over base flashing.
 - 3. Lap counterflashing joints minimum of 4 in (100 mm). Secure in waterproof manner by means of anchor and washer at 12 inches (300 mm) o.c. along perimeter and 6 inches (150 mm) o.c. at corners areas centers unless otherwise indicated.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with sealant and clamp flashing to pipes that penetrate roof.

3.7 INSTALLATION OF WALL FLASHING

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 in (100 mm) over top edge of base flashings.

3.8 EMBEDDED FLASHINGS

- A. General: Drawings may not necessarily indicate or describe full extent of Work required for completion of embedded flashing.
- B. Scheduled Locations: In addition to conditions shown on Drawings, install embedded flashings within cavity at following locations to direct downward flow of infiltrated water within cavity to exterior:
 - 1. Shelf angles with end dams at through-wall openings; and with lap joints.
 - 2. Lintels with end dams or laps.
 - 3. Jambs at through-wall openings, full height from sill to head.
 - 4. Penetrations, parapet terminations into adjacent walls and other wall terminations.
 - 5. Other obstructions.

- C. Preparation: Substrate surfaces shall be smooth and free from projections that could puncture flashing.
- D. Flashing Installation:
 - 1. Install sheet metal flashing true to line and levels indicated; minimize quantity of lap joints by using longest units possible.
 - 2. Set shaped sheet metal units in proper locations with outside hemmed edges flush with building face location indicated; attach cavity side flanges to sheathed steel stud wall with screw fasteners driven into studs.
 - 3. At continuous shelf angles, terminate horizontal flashings at through-wall openings with properly folded and constructed sheet metal end dams, with continuous soldered joints.
 - 4. At lintels, terminate horizontal flashings at end of lintel with properly folded and constructed sheet metal end dams, with continuous soldered joints.
 - 5. At lap joints of horizontal flashings, form neat and aligned joints by interlocking splice plate within hemmed edge of sheet metal flashing profile; apply sealant and rubberized asphalt flashing as indicated to create water-resistant joint.
 - 6. Set shaped sheet metal units at jambs of through-wall openings and lap inside of end dams at horizontal flashings below, coordinate installation with rigid cavity insulation, if applicable.
 - 7. Seal cavity edges of sheet metal flashings within cavity to sheathing with continuous rubberized asphalt flashing.
- E. Examination and Repair: Immediately prior to laying exterior veneer, examine exposed surfaces of flashing and seal penetrations and damaged areas with rubberized asphalt flashing material before covering with exterior veneer.
- F. Asphalt Mastic Dampproofing Application: Apply continuous layer of product, without pinholes or holidays, at locations as indicated on drawings. Apply at coverage rate instructed by manufacturer.
 - 1. Repair voids and damage. Patch with additional layer of asphalt mastic dampproofing extending 6 in (150 mm) beyond repaired areas in all directions.

3.9 INSTALLATION OF MISCELLANEOUS FLASHING

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

3.10 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 in in 20 ft (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8 in (3mm) offset of adjoining faces and of alignment of matching profiles.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: The Owner may employ and pay a qualified independent testing agency to perform field quality control. Materials and installation failing to meet specified requirements shall be replaced at Contractor's expense. Retesting of materials and installations failing to meet specified requirements shall be done at Contractor's expense.
 - 1. Refer to Owner's Building Enclosure Commissioning Plan for Field Observations and Performance Testing Activities.

3.12 CLEANING

- 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.

3.13 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- B. Touchup Painting: Clean abraded or damaged areas of shop paint finish and paint exposed areas with the same material used for shop painting. Touchup finish is to match undamaged finish and extend into retained adjoining finish in a manner that will minimize evidence of touchup.
- C. 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, as determined by Architect.

END OF SECTION