UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07 62 13

COPPER SHEET METAL FLASHING AND TRIM

08/09

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Preparing Activity: USACE

Nontechnical Title Revision
(August 2015)

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SECTION 07 62 13

COPPER SHEET METAL FLASHING AND TRIM
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NOTE: This guide specification covers the requirements for copper sheet metal used as flashing, including gutters and downspouts and for historic structures which require roof repairs.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

NOTE: Details of sheet metalwork will be shown on project drawings in accordance with the appropriate details in the Architectural Sheet Metal Manual of the Sheet Metal and Air Conditioning Contractors National Association, except that the first ply of roofing will not be extended into gutters.

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide

specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B32	(2020) Standard Specification for Solder Metal
ASTM B152/B152M	(2019) Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B370	(2022) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM C1136	(2023) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D4586/D4586M	(2007; R 2018) Asphalt Roof Cement, Asbestos-Free
ASTM F547	(202) Standard Terminology of Nails for Use with Wood and Wood-Base Materials

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-51145	(Rev D; Notice 1; Notice 2; Notice 3; Notice 4) Flux, Soldering, Non-Electronic, Paste and Liquid

1.2 SYSTEM DESCRIPTION

a. Perform sheet metalwork to accomplish weathertight construction. Install the work without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction. Perform cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades by sheet metal mechanics. Hem exposed edges. Angle bottom edges of exposed vertical surfaces to form drips. Form flashing into a 3-dimensional configuration, at the end of a run. to direct water to the outside of the system. Weights and thicknesses of copper flashing are as specified in TABLE 1. Install joints as specified in TABLE 2. Provide accessories and other items, essential to complete the sheet metal installation, though not specifically indicated or specified.

b. Coordinate installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous roofing operations. Pack factory-fabricated components in cartons marked with the manufacturer's name or trademark printed or embossed at frequent intervals to permit easy identification. Sheet metalwork pertaining to heating, ventilating, and air conditioning is specified in other sections.

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NOTE: Galvanic action between dissimilar metals must be avoided in order to prevent corrosion. In replacing flashing, gutters and other copper sheet metal items on historic structures, it is often necessary to reuse existing non-copper support or connecting items. Proper insulation between unlike materials will provide protection against galvanic action and subsequent deterioration.

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c. Use proper insulation to avoid galvanic action between copper and iron or steel. Insulate the copper covering the steel member with insulation; placing strips of sheet lead between the two metals; or by heavily tinning the iron.

1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the

Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Sheet Metal

SD-03 Product Data

Contractor Quality Control

SD-04 Samples

Materials

1.4 DELIVERY, STORAGE, AND HANDLING

Adequately package and protect materials during shipment and inspect for damage, dampness, and wet-storage stains upon delivery to the jobsite. Clearly label materialsas to type and manufacturer. Handle sheet metal items carefully to avoid damage. Store materials in dry, weathertight, ventilated areas until installation.

PART 2 PRODUCTS

2.1 MATERIALS

Provide materials conforming to the requirements specified below, and those given in TABLE 1. Materials exposed to weather must be copper. Recyclable materials (building paper, etc.) must conform to EPA requirements in conformance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING. Submit samples of materials proposed for use, upon request.

2.1.1 Asphalt Roof Cement

ASTM D4586/D4586M, Type I.

2.1.2 Fasteners

Provide fasteners conforming to TABLE 1. Provide nails conforming to ASTM F547 or as approved. Provide copper nails and rivets. Provide bronze screws and bolts. Fasteners must be the best type for the application.

2.1.3 Felt

ASTM D226/D226M, Type II.

2.1.4 Flux

CID A-A-51145, Type I.

2.1.5 Slip Sheet

Building paper meeting the requirements of ASTM C1136, Type IV, style optional.

2.1.6 Sheet Metal

Furnish sheet metal conforming to ASTM B152/B152M, ASTM B370, Light cold-rolled temper (H00) copper. Submit drawings showing weights, gauges, or thickness of sheet metal; type of material; joining, expansion-joint spacing, and fabrication details; and installation procedures. Do not deliver materials to the site until after the approved detail drawings have been returned to the Contractor.

2.1.7 Solder

ASTM B32 Sn50.

2.2 SEALANTS AND SEALING COMPOUNDS

Sealants and sealing compounds are specified in Section 07 92 00 JOINT SEALANTS.

PART 3 EXECUTION

3.1 EXISTING COPPER SHEET METAL

Salvage existing, original, historic copper sheet metal elements that are intact and serviceable and reuse whenever possible. This may include, but is not limited to, gutters, hangers, downspouts, connectors, leader heads, leader straps, basket strainers, splash pans, and other architectural sheet metal elements such as finials, and decorative panels. When work involves repair and replacement of copper sheet metal elements, match new elements to existing original elements as closely as possible.

3.2 SOLDERING AND SEAMING

3.2.1 Soldering

Pretin edges of sheet metals, except lead coated materialbefore soldering

is begun. Solder slowly with well heated soldering irons to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Scrape or wire-brush edges of lead coated material to be soldered to produce a bright surface, and brush a liberal amount of flux in seams before soldering is begun. Solder immediately after applying flux. Upon completion of soldering, thoroghly clean the acid flux residue from the sheet metal with a solution of washing soda in water and rinse with clean water.

3.2.2 Seams

Finish flat-lock and soldered-lap seams no less than 25 mm 1 inch wide. Do not lap unsoldered plain-lap seams less than 75 mm 3 inches unless otherwise specified. Make flat seams in the direction of the flow.

3.3 COVERING ON MINOR FLAT, PITCHED, OR CURVED SURFACES

Unless otherwise indicated, cover or flash minor flat, pitched, or curved surfaces, such as crickets, bulkheads, dormers, and small decks with 450 x 600 mm 18 x 24 inch metal sheets and secure with cleats. Apply one ply of felt covered with 1 ply of slip sheet as underlayment on wood surfaces. Place 2 cleats on the long side and place 1 cleat on the short side. Lock and solder seams.

3.4 CLEATS

Provide a continuous cleat where indicated or specified to secure loose edges of the sheet metalwork. Space butt joints approximately 3 mm 1/8 inch apart. Fasten the cleat to the supporting construction with nails evenly spaced not over 300 mm 12 inches on centers. Where the fastening is to be made to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. Install the cleat for fascia anchorage to extend below the supporting construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm 3/4 inch. The cleat must be wide enough to provide adequate bearing area to ensure a rigid installation. Where horizontal nailer is vented for insulation and the cleat is placed over masonry or concrete, install the cleat over 1.6 mm 1/16 inch thick metal washers placed at screws. Use metal washers that are electrolytically compatible with the continuous cleat.

3.5 EXPANSION JOINTS

Provide expansion joints at 12.0 meter 40 foot intervals, except that where the distance between the last expansion joint and the end of the continuous run is more than half the required interval spacing, provide an additional joint. Space joints evenly.

3.6 FLASHINGS

3.6.1 General

Install flashings at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof, and floor drains, and for electrical conduit projections through roof or walls is covered in appropriate sections for such work. Turn cap flashings around exterior corners of masonry or concrete walls at least 50 mm 2 inches, secure into masonry joints and into concrete with expansion anchors and seal with No. 2 or 4 sealing

compound. Use corner units that have mitered joints, install with 75 mm 3 inch lap joint over flashings on each side. Unless otherwise indicated, terminate through-wall flashing 13 mm 1/2 inch inside each exposed face of the wall. Provide cap flashings over base flashings. Cover up perforations in flashings made by masonry anchors by applying bituminous plastic cement at the perforation. For exposed and unfastened flashings, turn the edge of the strip under 13 mm 1/2 inch. Install flashing on top of joint reinforcement.

3.6.2 Base Flashings

a. Extend base flashings under the uppermost row of tile the full depth of the tile or at least 100 mm 4 inches over the tile immediately below the metal.

b. Turn up the vertical leg of the metal not less than 100 mm 4 inches and preferably 200 mm 8 inches on the abutting surface. Where a vertical surface butts against the roof slope, build the base flashing into each course of tile as it is laid, turning the metal out 100 mm 4 inches on the tile and at least 200 mm 8 inches above the roof.

c. Where the roof stops against a stuccoed wall, secure a wood 2 x 4 with a beveled top edge to the wall. Then turn out base flashing over the tile at least 100 mm 4 inches and bend up vertically at least 75 mm 3 inches on the board.

d. Turn out the base flashing 100 mm 4 inches on the roof surface and from 150 to 200 mm 6 to 8 inches on the vertical surface for either sloping or flat slate roofs.

e. Use base flashings where posts, flagpoles, or scuttles project through the roof. Vent pipes must have base flashings in the form of special sleeves and/or EPDM boots.

3.6.3 Cap Flashings (Counterflashings)

Where the base flashing is not covered by vertical tile or siding, build a cap flashing into the masonry joints lapping not less than 50 mm 2 inches vertically, extending down over the base flashing 100 mm 4 inches, and the edge bent back and up 13 mm 1/2 inch.

3.6.4 Stepped Flashing

Install stepped flashing where sloping roofs surfaced with tiles abut vertical surfaces. Place separate pieces of base flashing in alternate tile courses. Extend each piece of base flashing out onto the roof at least 100 mm 4 inches and nail to the deck. Extend the stepped base flashing up along the wall not less than 100 mm 4 inches and stop beneath the cap flashing or anchor beneath wood siding in frame construction. Set cap flashings in a reglet into masonry and concrete construction, and lap cap flashing over the flashing below not less than 75 mm 3 inches. Lap the stepped base flashing at vertical joints between the sections not less than 75 mm 3 inches.

3.6.5 Valley Flashing

Valley flashing must be free from longitudinal seams and wide enough to extend not less than 150 mm 6 inches under the roof covering on each side. Lap the sheets not less than 200 mm 8 inches in the direction of

flow and secure to roofing construction with cleats on each side. Space cleats not more than 600 mm 24 inches on centers. Do not puncture the copper sheet with nails at any place.

3.6.5.1 Open Valley Flashings

a. Open valleys must be not less than 100 mm 4 inches wide. Determine the proper width by the following rule: Starting at the top with a width of 100 mm 4 inches, increase the width 25 mm 1 inch for every 2.4 meters 8 feet of length of the valley. Flashing pieces must be full length sheets and of sufficient width to cover the open portion of the valley and extend up under the roofing not less than 150 mm 6 inch on each side.

b. Where two valleys of unequal size come together; where the areas drained by the valley are unequal; where the slope of the valley is 26 degrees or less (500 mm per meter or less 6 inches or less per foot;) or where the intersecting roofs are of different slopes, provide an inverted V-joint 25 mm 1 inch high along the centerline of the valley, and extend the edge of the valley sheets 200 mm 8 inches under the roof covering on each side.

3.6.5.2 Closed Valleys

a. Flashing pieces for closed valleys must be long enough to extend 50 mm 2 inches above the top of the roofing piece and lap the flashing piece below 75 mm 3 inches, and of sufficient width to extend up the sides of the valley far enough to make the valley 200 mm 8 inches deep.

b. Place flashing with the roofing so that all pieces are separated by a course of tile. Set pieces so as to lap at least 75 mm 3 inches and to be entirely concealed by the tiles. Fasten flashing by nails at the top edge only.

3.6.6 Through-Wall Flashing

Through-wall flashing includes sill, lintel, and spandrel flashing. Lay the flashing with a layer of mortar above and below the flashing so that the total thickness of the two layers of the mortar and flashing are the same thickness as the regular mortar joints. Flashing must be one piece for lintels and sills.

3.6.6.1 Lintel Flashing

Extend lintel flashing the full length of lintel. Extend it through the wall one masonry course above the lintels and bend down over the top of masonry and precast concrete lintels. Underlay bedjoints of lintels at control joints with sheet metal bond breaker.

3.6.6.2 Sill Flashing

Extend sill flashing the full width of the sill and not less than 100 mm 4 inches beyond ends of sill except at a control joint where the flashing is terminated at the end of the sill.

3.6.7 Eave and Rake Flashings

Place eave and rake flashings in accordance with SMACNA 1793.

3.7 REGLETS

Reglets must be a factory fabricated product, complete with fittings and special shapes as may be required. Provide open-type reglets filled with fiberboard or other suitable separator to prevent crushing of the slot during installation. Locate reglets no less than 200 mm 8 inches nor more than 400 mm 16 inches above roofing not having cant strips or locate no less than 125 mm 5 inches nor more than 325 mm 13 inches above cant strip. Do not space reglet plugs over 300 mm 12 inches on centers and fill reglet grooves with sealant. Friction or slot-type reglets must have metal flashings inserted the full depth of slot and must be lightly punched every 300 mm 12 inches to crimp the reglet and cap flashing together.

3.8 GRAVEL STOPS AND FASCIA

Fabricate sheets without longitudinal joints except where 2-piece fasciae are used when fascia depth exceeds 175 mm 7 inches. Provide provision for expansion at joints. Provide factory fabricated internal and external corner units with mitered joints. Extend roof flange and splice plate of the gravel stop and fascia out on the roof no less than 100 mm 4 inches, and set in bituminous cement over the roofing felt. Secure roof flange with nails spaced no greater than 75 mm 3 inches on centers located within 25 mm 1 inch of the outer edge of the flange. Do not face nail the fascia section except as specified for 2-piece fascia. The upper piece of two-piece fascia must be the same as specified above except that the fascia depth must be at least 90 mm 3-1/2 inches, and must overlap the lower fascia not less than 50 mm 2 inches. Hook the lower piece 13 mm 1/2 inch over edge strip and splice plate and face nail on 300 mm 12 inch centers 25 mm 1 inch below top of sheet. Hem the upper fascia 13 mm 1/2 inch at lower edge and form to fit tight against lower fascia.

3.9 DOWNSPOUTS

Set downspouts plumb and no less than 25 mm 1 inch from the wall. Provide leaders to connect gutters on overhanging eaves to downspouts. Set leaders with a slope no less than 0.3 degrees, 5 mm per m 1/16 inch per foot or more than 30 degrees below a horizontal line. Fit leaders over the outlet tube in gutter bottom. Fit into and rivet to the downspout. Rivet spacing more than 50 mm 2 inches is not permitted. Loosely set strainers in the eave tube opening in gutter. Make joints between lengths of downspouts by telescoping the end of the upper lengths at least 19 mm 3/4 inch into the lower length. Neatly fit downspouts terminating in drainage lines into downspout boots and fill the joint with a portland cement mortar cap sloped away from downspout. Provide downspouts terminating at splash blocks or splash pans with stock elbow-type fittings. Provide downspout hangers adjacent to the joint at the top of each section of downspout, except that the bottom section must have an additional strap adjacent to the bottom joint when splash blocks or splash pans are required. Hangers must be 1.5 x 25 mm 1/16 x 1 inch flat stock of the same material as the downspout.

3.10 GUTTERS

Terminate gutters at least 13 mm 1/2 inch away from vertical surfaces. [Anchor supporting cleats to the structure at spacings not exceeding 400 mm 16 inches.] [Fasten gutter brackets and spacersto roof nailer by screws or deformed shank-type nails and interlock with or fasten to the leading edge of gutter. Gutter spacers must be 1.5 x 25 mm 1/16 x 1 inch

flat-stock of the same material as the gutter. Alternate brackets and spacers at not more than 900 mm 36 inches on centers.] hang gutters with high points at ends or equidistant from downspouts and [level] [slope not less than 0.3 degrees 5 mm per m 1/16 inch per foot].

3.11 SCUPPER LININGS

Line the interior of scupper openings with sheet metal. Form the lining to return not less than 25 mm 1 inch against both faces of the wall or parapet with the outside edges folded under 13 mm 1/2 inch less on the top and sides. The perimeter of the lining must be approximately 13 mm 1/2 inch less than the perimeter of the scupper. Join the top and sides of scuppers on the roof-deck side to base flashing by a locked and soldered joint. Join the bottom edge by a locked and soldered joint to the base flashing and where required, form with a ridge to act as a gravel stop around the scupper inlet. Coat surfaces to receive the lining with bituminous cement.

3.12 SPLASH PANS

Install splash pans where downspouts discharge on roof surfaces and at other locations as indicated. Pans must be of size indicated. Bed pans and roof flanges in plastic bituminous cement and strip flashed.

3.13 CONTRACTOR QUALITY CONTROL

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NOTE: When justified by the amount or criticality of the roofing involved, and similar requirements are not established for the Contractor Quality Control organization specified elsewhere, the following requirement will be added at the end of the paragraph:

A roofing technician responsible directly to the Contractor and experienced in the construction of the specified roofing system and related work must perform the quality control functions and be on the site whenever roofing operations are in progress.

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Establish and maintain a quality control procedure for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Promptly remove and replace or correct any work found not to be in compliance with the contract in an approved manner. Submit a Quality Assurance Plan, including a checklist of points to be observed, prior to start of roofing work. Quality control includes, but is not limited to, the following:

a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.

b. Verification of compliance of materials before, during, and after installation.

c. Inspection of sheet metalwork, for proper size and thickness, fastening and joining, and proper installation.

Document the actual quality control observations and inspections and

furnish a copy of the documentation to the Contracting Officer at the end of each day.

TABLE 1 - COPPER SHEET METAL WEIGHTS AND THICKNESSES	
Item Description	Copper (kg/square moz/square foot)
Building expansion joints: Cap	4.9 16
Building expansion joints: Waterstop - bellows or flanged-U-type	4.9 16
Cleats (Continuous)	7.3 24
Covering on minor flat, pitched or curved surfaces	6.1 20
Downspouts, heads and leaders	4.9 16
Flashings: Base	6.1 20
Flashings: Cap, stepped or valley	4.9 16
Gravel stops and fasciae: Sheets, corrugated	4.9 16
Gutters (girth): Up to 380 mm15 inches	4.9 16
Gutters (girth): 380 to 510 mm15 to 20 inches	4.9 16
Gutters (girth): 510 to 635 mm20 to 25 inches	6.1 20
Gutters (girth): 635 to 760 mm25 to 30 inches	7.3 24
Gutter brackets (girth): Up to 380 mm15 inches	3 x 25 mm 1/8 x 1 inch
Gutter bracket s (girth): 380 to 510 mm 15 to 20 inches	6 x 25 mm 1/4 x 1 inch
Gutter brackets (girth): 510 to 610 mm20 to 24 inches	6 x 38 mm 1/4 x 1 1/2 inch
Gutter cleats and cover plates	4.9 16
Scupper lining	6.1 20
Strainers (wire gauge)	No. 9
Reglets (1)	3.1 10
Splash pans	4.9 16
Copings	4.9 16
Pitch pockets	4.9 16
Through-wall, flashings above roof line	4.9 16
Through-wall, below roof line, except as otherwise specified in paragraph MATERIALS	3.1 10

TABLE 2 - COPPER SHEET METAL JOINTS	
Item Designation	Type of Joint
Building expansion joint at roof	32 mm1-1/4 inch single lock standing seam, cleated
Cleats (Continuous)	Butt
Flashings: Base	25 mm1 inch flat locked, soldered 75 mm3 inch lap for expansion joint
Cap - in reglet	75 mm3 inch lap
Cap - two - piece	Receiver 75 mm 3 inch lap Cap piece 75 mm 3 inch lap
Stepped	75 mm3 inch lap
Through-wall spandrel flashing (metal	38 mm1-1/2 inch mechanical interlock
Valley	150 mm6 inch lap, cleated
Sheet, corrugated	Butt with 6 mm 1/4 inch
Sheet, smooth	Butt with 6 mm 1/4 inch space
Gutters	38 mm1-1/2 inch lap, riveted and soldered
Pitch pockets	25 mm1 inch soldered lap
Reglets	Butt joint

-- End of Section --