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ITALIAN GUIDE SPECIFICATIONS

Use for ITALIAN projects only

SECTION 07600

FLASHING AND SHEET METAL
06/03

NOTE: This guide specification is issued by the
Atlantic Division, Naval Facilities Engineering
Command for regional use in Italy.

NOTE: This guide specification includes the
requirements for flashing and sheet metal work
including gutters and downspouts, scuppers, splash
pans, and sheet metal roofing. The specified sheet
metal roofing is the type commonly used for on-site
fabrication which does not include factory
fabricated or preformed metal roofing. Preformed
and Standing Seam metal roofing is covered in other
Division 7 sections. Gravity roof ventilators, roof
scuttles, louvers, and similar items are not
included. This guide specification requires
extensive editing when used with single ply roof
systems in order to assure compatibility.

NOTE: A standard reference for sheet metal
fabrication and assembly similar to the SMACNA
Architectural Sheet Metal Manual has not been found
as of this date in Europe. Include details on the
drawings that cover conditions indicated in this
manual.

NOTE: On the drawings, show:

1. Base, counter open valley, and eave flashing
2. Roof drain flashing

3. Expansion joints - (The drawings should contain interior and exterior details of building expansion joints at walls, ceiling, floors, roof, and parapets. Provide isometric detailing for expansion joint intersections.)

4. Sheet metal roofing; extent and slope.

5. Gutters and downspouts.

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

EUROPEAN COMMITTEE FOR STANDARDIZATION (EN)

CEN EN 288-4	(1992) Specification and Approval of Welding Procedures for Metallic Materials - Part 4: Welding Procedure Tests for the Welding of Aluminum and Its Alloys
CEN EN 485-1	(1993) Aluminum and Aluminum Alloys - Sheet, Strip and Plate - Part 1: Technical Conditions for Inspection and Delivery
CEN EN 485-2	(1994) Aluminum and Aluminum Alloys - Sheet, Strip and Plate - Part 2: Mechanical Properties
CEN EN 485-3	(1993) Aluminum and Aluminum Alloys - Sheet, Strip and Plate - Part 3: Tolerances on Shape and Dimensions for Hot Rolled Products
CEN EN 485-4	(1993) Aluminum and Aluminum Alloys -

Sheet, Strip and Plate - Part 4:
Tolerances On Shape and Dimensions for
Cold Rolled Products

- CEN EN 755-3 (1995) Aluminum and Aluminum Alloys - Extruded Rod/Bar, Tube and Profiles, Part 3: Round Bars, Tolerances on Dimensions and Form
- CEN EN 755-4 (1995) Aluminum and Aluminum Alloys - Extruded Rod/Bar, Tube and Profiles, Part 4: Square Bars, Tolerances on Dimensions and Form
- CEN EN 755-5 (1995) Aluminum and Aluminum Alloys - Extruded Rod/Bar, Tube and Profiles, Part 5: Rectangular Bars, Tolerances on Dimensions and Form
- CEN EN 988 (1996) Zinc and Zinc Alloys - Specifications for Rolled Flat Products for Building
- CEN EN 1412 (1995) Copper and Copper Alloys - European Numbering System
- CEN EN 1172 (1996) Copper and Copper Alloys - Sheet and Strip for Building Purposes
- CEN EN 1173 (1995) Copper and Copper Alloys - Material Condition or Temper Designation
- CEN EN 10088-1 (1995) Stainless Steels - Part 1: List of Stainless Steels
- CEN EN 10088-2 (1995) Stainless Steels - Part 2: Technical Delivery Conditions for Sheet/Plate and Strip for General Purposes
- CEN EN 10142 (2000) Continuously Hot Dip Zinc Coated Low Carbon in Steels Strip and Sheet for Cold Forming - Technical Delivery Conditions
- CEN EN 10143 (1993) Continuously Hot-Dip Metal Coated Steel Sheet and Strip - Tolerances on Dimensions and Shapes

INTERNATIONAL STANDARDS ORGANIZATION (ISO)

- ISO 9453 (1990) Soft Solder Alloys - Chemical Compositions and Forms First Edition (CEN EN 29453: 1993)

ITALIAN NATIONAL ASSOCIATION FOR UNIFICATION OF STANDARDS (UNI)

UNI 4163

(1959) Roof Waterproofing Bitumens for Spreading. Determination of Degree of Penetration of Bitumens

1.2 SUBMITTALS

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item is required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Recommended codes for Army projects are "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-01 Preconstruction Submittals

Quality Control Plan

Submit for sheet metal work in accordance with paragraph entitled "Field Quality Control."

SD-02 Shop Drawings

Covering on flat, sloped, or curved surfaces G

Gutters G

Downspouts G
Expansion joints G
Gravel stops and fascias G
Splash pans G
Flashing for roof drains G
Base flashing G
Counterflashing G
Flashing at roof penetrations G
Reglets G
Scuppers G
Copings G
Drip edge G
Conductor heads G
Open valley flashing G
Eave flashing G

Indicate thicknesses, dimensions, fastenings and anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

1.3 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until immediately before installation.

PART 2 PRODUCTS

2.1 MATERIALS

NOTE: Permit use of optional materials to extent that project design, relative costs, local environmental conditions, and commercial availability permit. Relative costs for materials listed in Table I range from 100 as index for

stainless steel followed by terne-coated stainless steel, zinc-coated steel, and copper in that order down to approximately 50 for aluminum, based on weights, gages and thicknesses indicated. Exposed sheet metal should be of materials noted except where additions to buildings are made, match existing if appearance of structure would be detrimentally affected by of different material. Use aluminum to match existing exposed zinc-alloy or galvanized metal, except use stainless steel in highly corrosive atmospheres such as around or in industrial buildings or in coastal areas that experience high winds or sand abrasion problems. Where Contractor's choice is limited because of above conditions, revise accordingly. Delete inapplicable items. Weights and thicknesses listed are minimum for items described. If greater weights and thicknesses are justified by unusual local conditions, modify accordingly.

Furnish sheet metal items in 2400 to 3000 mm 8 to 10 foot lengths. Single pieces less than 2400 mm 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 300 mm 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. These accessories shall be made of the same materials as the items to which they are applied. Fabricate sheet metal items of the materials specified below and to the gage, thickness, or weight shown in Table I at the end of this section. Sheet metal items shall have mill finish unless specified otherwise. Where more than one material is listed for a particular item in Table I, each is acceptable and may be used except as follows:

2.1.1 Exposed Sheet Metal Items

Materials are listed in Table I. Any of the materials specified therein may be selected by the Contractor; however, all exposed sheet metal items shall be of the same material. The following items shall be considered as exposed sheet metal: gutters, including hangers; downspouts and leaders; gravel stops and fascias; cap, valley, stepped base, and eave flashings and related accessories.

2.1.2 Drainage

Do not use copper for an exposed item if drainage from that item will pass over exposed masonry, stonework or other metal surfaces. In addition to the metals listed in Table I, lead-coated copper may be used for such items.

2.1.3 Copper, Sheet and Strip

CEN EN 1412, CEN EN 1172, CEN EN 1173, cold-rolled temper.

2.1.4 Lead Sheet

Minimum weight 19.6 kilograms per square meter 4 pounds per square foot.

2.1.5 Steel Sheet, Zinc-Coated (Galvanized)

NOTE: Factory-applied color coating on sheet aluminum and galvanized steel may be used on building additions where necessary to match existing galvanized or other exposed painted metal work. This coating may also be used on sheet aluminum and galvanized steel surfaces of new buildings where a long-life exterior color finish is desired.

CEN EN 10142, CEN EN 10143.

2.1.5.1 [Finish

Exposed exterior items of zinc-coated steel sheet shall have a baked-on, factory-applied color coating of polyvinylidene fluoride (PVF2) or other equivalent fluorocarbon coating applied after metal substrates have been cleaned and pretreated. Finish coating dry-film thickness shall be 0.020 to 0.033 mm 0.8 to 1.3 mils and color shall be [_____].

2.1.6 Zinc Sheet and Strip

CEN EN 988, a minimum of 0.61 mm 0.024 inch thick.

2.1.7 Stainless Steel

NOTE: Factory-applied color coating on sheet aluminum and galvanized steel may be used on building additions where necessary to match existing galvanized or other exposed painted metal work. This coating may also be used on sheet aluminum and galvanized steel surfaces of new buildings where a long-life exterior color finish is desired.

CEN EN 10088-1, CEN EN 10088-2, Grade B.5, Brushed finish, fully annealed, dead-soft temper.

2.1.8 Terne-Coated Stainless Steel

Minimum of 350 by 500 mm with minimum of 18 kilogram coating per double base box.

2.1.9 Aluminum Alloy Sheet and Plate

NOTE: Factory-applied color coating on sheet aluminum and galvanized steel may be used on

building additions where necessary to match existing galvanized or other exposed painted metal work. This coating may also be used on sheet aluminum and galvanized steel surfaces of new buildings where a long-life exterior color finish is desired.

CEN EN 485-1, CEN EN 485-2, CEN EN 485-3, CEN EN 485-4, form alloy, and temper appropriate for use.

2.1.9.1 Alclad

When fabricated of aluminum, the following items shall be fabricated of clad on [one side] [both sides] [one side, unless otherwise indicated].]

- a. Gutters, downspouts, and hangers
- b. Gravel stops and fascias
- [c. Flashing.]

2.1.9.2 Finish

Exposed exterior sheet metal items of aluminum shall have a baked-on, factory-applied color coating of polyvinylidene fluoride (PVF2) or other equivalent fluorocarbon coating applied after metal substrates have been cleaned and pretreated. Finish coating dry-film thickness shall be 0.020 to 0.033 mm, and color shall be [_____].

2.1.10 Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubes

CEN EN 755-3, CEN EN 755-4, CEN EN 755-5.

2.1.11 Solder

ISO 9453.

2.1.13 Bituminous Plastic Cement

UNI 4163.

2.1.14 Building Paper

Uncreped, glass fiber or polyester reinforced, 294 grams pers mm dry tensile strength, 16 hour minimum water resistance.

2.1.16 Asphalt Primer

UNI 4163.

2.1.15 Through-Wall Flashing

Through-wall flashing for masonry is specified in Section 04200, "Unit Masonry."

2.1.16 Fasteners

Use the same metal or a metal compatible with the item fastened. Use stainless steel fasteners to fasten dissimilar materials.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Requirements

NOTE: On-site fabricated flat copper, zinc, or terne-coated stainless steel metal roofing is not included in text of this guide specification because it is infrequently used. These materials do not require field painting. (However, if terneplate is used, field painting must be specified: one coat of iron oxide paint on underside before application, and on exposed surfaces after application. Exposed surfaces also require finish coat of compatible exterior oil paint over iron oxide paint). If design requires this type of metal roofing, include the following under paragraph entitled "INSTALLATION" and edit to suit:

"[Flat Copper,] [Zinc,] [Terne-coated Stainless Steel] Roofing: Before applying roofing, cover deck with rosin-sized building paper. Lap 50 mm 2 inches at joints and secure in place with roofing nails. Using solder of equal parts tin and lead, solder slowly with well-heated irons to thoroughly heat sheet and completely sweat solder through full width of seam. [Tin edges of copper to be soldered at least 20 mm 3/4 inch before sheets are locked.] [Use stainless nails in terne-coated stainless steel]; [in copper, use solid copper or bronze roofing nails] [in zinc, use zinc-coated roofing nails.] Where roof decks abut vertical surfaces, turn metal roofing up vertical surfaces about 200 mm 8 inches where practicable; where vertical surfaces are covered with applied materials, turn up roofing behind applied materials. Use standing-seam method for roofs having rise of more than one in four 3 inches per foot, and use flat-seam method when rise is one in four 3 inches per foot or less. Walking not permitted directly on metal roofs; provide approved walkways.

"Standing-seam Method: Make standing seams parallel with slope of roof. Fabricate sheets into long lengths at shop by locking short dimensions together and thoroughly soldering joints thus formed. In

applying metal, turn up one edge of course at each side seam at right angles 40 mm 1.5 inches. Then install 50 by 75 mm 2 by 3 inch cleats spaced 300 mm 12 inches apart by fastening one end of each cleat to roof with two 25 mm one inch long nails and folding roof end back over nail heads. Turn end adjoining turned-up side seam up over upstanding edge of course. Turn up adjoining edge of next course 45 mm 1.75 inches and abutting upstanding edges locked, turned over, and flattened against one side of standing seam. Make standing seams straight, rounded neatly at the top edges, and stand about 25 mm one inch above roof deck. All sheets shall be same length, except as required to complete run or maintain pattern. Locate transverse joints of each panel half way between joints in adjacent sheets. Align joints of alternate sheets horizontally to produce uniform pattern.

"Flat-seam Method: Lay metal so short dimension is parallel to gutter or eave lines and so water will flow over and not into seams. Make seams by turning edges of sheet 20 mm 3/4 inch and lock and solder together. If sheets are laid one at a time, secure to roof deck with cleats, using three cleats to each sheet, two on long side and one on short side. Use cleats 50 mm inches wide, hooked over 20 mm 3/4 inch upturned edges of sheets, and nail to roof deck with two 25 mm one inch long nails. Turn back roof end of cleat over nail heads before next sheet is applied. If desired, sheets may be made into long lengths at shop by locking short dimensions together and soldering seams thus formed. Turn long lengths 20 mm 3/4 inch, and secure each length to roof deck by cleats spaced 300 mm 12 inches apart. Mallet and solder seams after pans are in place." All sheets to be same length, except as required to complete run or maintain pattern. Locate transverse joints of each panel half way between joints in adjacent sheets. Align joints of alternate sheets horizontally to produce uniform pattern.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight. Join sheet metal items together as shown in Table II.

3.1.2 Workmanship

Make lines, arrises, and angles sharp and true. Free exposed surfaces from visible wave, warp, and buckle, and tool marks. Fold back exposed edges

neatly to form a 13 mm hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

3.1.3 Nailing

Confine nailing of sheet metal generally to sheet metal having a maximum width of 450 mm. Confine nailing of flashing to one edge only. Space nails evenly not over 75 mm on centers and approximately 13 mm from edge unless otherwise specified or indicated. Face nailing will not be permitted. Where sheet metal is applied to other than wood surfaces, include in shop drawings, the locations for sleepers and nailing strips required to secure the work. Sleepers and nailing strips are specified in Section 06100, "Rough Carpentry."

3.1.4 Cleats

Provide cleats for sheet metal 450 mm 18 inches and over in width. Space cleats evenly not over 300 mm 12 inches on centers unless otherwise specified or indicated. Unless otherwise specified, cleats shall be not less than 50 mm wide by 75 mm long 2 inches wide by 3 inches long and of the same material and thickness as the sheet metal being installed. Secure one end of the cleat with two nails and the cleat folded back over the nailheads. Lock the other end into the seam. Provide cleats for soldered seams.

3.1.5 Bolts, Rivets, and Screws

Install bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection.

3.1.6 Seams

Straight and uniform in width and height with no solder showing on the face.

3.1.6.1 Flat-lock Seams

Finish not less than 20 mm 3/4 inch wide.

3.1.6.2 Lap Seams

Finish soldered seams not less than 25 mm one inch wide. Overlap seams not soldered, not less than 75 mm 3 inches.

3.1.6.3 Loose-Lock Expansion Seams

Not less than 75 mm 3 inches wide; provide minimum 25 mm one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 3 mm 1/8 inch thick bed. Sealants are specified in Section 07920, "Joint Sealants."

3.1.6.4 Standing Seams

Not less than 25 mm one inch high, double locked without solder.

3.1.6.5 Flat Seams

Make seams in the direction of the flow.

3.1.7 Soldering

Where soldering is specified, it shall apply to copper, terne-coated stainless steel, zinc-coated steel, and stainless steel items.

3.1.7.1 Edges

Pretin edges of sheet metals before soldering. Slowly solder with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Scrape or wire-brush the edges of lead-coated material to be soldered to produce a bright surface. Flux brush the seams in before soldering. Treat with soldering acid flux the edges of stainless steel to be pretinned. Solder immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a solution of washing soda in water and rinsed with clean water. Seal the joints in aluminum sheets of one mm 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.8 Welding and Mechanical Fastening

Use welding for aluminum of thickness greater than one mm 0.040 inch. Aluminum one mm 0.040 inch or less in thickness shall be butted and the space backed with formed flashing plate; or lock joined, mechanically fastened, and filled with sealant as recommended by the aluminum manufacturer.

3.1.8.1 Welding of Aluminum

Use welding of the inert gas, shield-arc type. For procedures, appearance and quality of welds, and the methods used in correcting welding work, conform to CEN EN 288-4.

3.1.8.2 Mechanical Fastening of Aluminum

Use No. 12, aluminum alloy, sheet metal screws or other suitable aluminum alloy or stainless steel fasteners. Drive fasteners in holes made with a No. 26 drill in securing side laps, end laps, and flashings. Space fasteners 300 mm 12 inches maximum on centers. Where end lap fasteners are required to improve closure, locate the end lap fasteners not more than 50 mm 2 inches from the end of the overlapping sheet.

3.1.9 Protection from Contact with Dissimilar Materials

3.1.9.1 Copper or Copper-bearing Alloys

Paint with heavy-bodied bituminous paint surfaces in contact with dissimilar metal, or separate the surfaces by means of moistureproof building felts.

3.1.9.2 Aluminum

Aluminum surfaces shall not directly contact other metals except stainless steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

3.1.9.3 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.1.9.4 Wood or Other Absorptive Materials

Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

3.1.10 Expansion and Contraction

Provide expansion and contraction joints at not more than 9750 mm 32 foot intervals for aluminum and at not more than 12 meter 40 foot intervals for other metals. Where the distance between the last expansion joint and the end of the continuous run is more than half the required interval, an additional joint shall be provided. Space joints evenly. Join extruded aluminum gravel stops and fascias by expansion and contraction joints spaced not more than 3600 mm 12 feet apart.

3.1.11 Base Flashing

NOTE: Bracketed first sentence applies only to shingled roofs. Do not include for built-up roofing. Normally, only bituminous base flashing should be specified with built-up roofing. Limit use of metal base flashing to locations where flashing is subject to injury by foot traffic and to runs of 6000 mm 20 feet or less when used with built-up roofing. Flashing for heating, plumbing, and electrical equipment should be specified in the appropriate sections.

[Lay the base flashings with each course of the roof covering, shingle fashion, where practicable, where sloped roofs abut chimneys, curbs, walls, or other vertical surfaces.] Extend up vertical surfaces of the flashing not less than 200 mm 8 inches and not less than 100 mm 4 inches under the roof covering. Where finish wall coverings form a counterflashing, extend the vertical leg of the flashing up behind the applied wall covering not less than 150 mm 6 inches. Overlap the flashing strips [or shingles] with the previously laid flashing not less than 75 mm 3 inches. Fasten the strips [or shingles] at their upper edge to the deck, with compatible, large-head roofing nails. Solder end laps and provide for expansion and

contraction. Extend the metal flashing over crickets at the up-slope side of [chimneys,] [curbs,] [and similar] vertical surfaces extending through sloping roofs, the metal flashings. Extend the metal flashings onto the roof covering not less than 115 mm 4.5 inches at the lower side of [dormer walls,] [chimneys,] [and similar] vertical surfaces extending through the roof decks. Install and fit the flashings so as to be completely weathertight. Base flashing for interior and exterior corners shall be factory-fabricated.

3.1.12 Counterflashing

Except where indicated or specified otherwise, insert counterflashing in reglets located from 230 to 250 mm 9 to 10 inches above roof decks, extend down vertical surfaces over upturned vertical leg of base flashings not less than 75 mm 3 inches. Fold the exposed edges of counterflashings 13 mm 1/2 inch. Where stepped counterflashings are required, they may be installed in short lengths or may be of the preformed one-piece type. Provide end laps in counterflashings not less than 75 mm 3 inches and make it weathertight with plastic cement. Do not make lengths of metal counterflashings exceed 3000 mm 10 feet. Form the flashings to the required shapes before installation. Factory-form the corners not less than 300 mm 12 inches from the angle. Secure the flashings in the reglets with lead wedges and space not more than 450 mm 18 inches apart; on [chimneys and] short runs, place wedges closer together. Fill calked-type reglets or raked joints which receive counterflashing with calking compound. Calking is covered in Section 07920, "Joint Sealants." Turn up the concealed edge of counterflashings built into masonry or concrete walls not less than 6 mm 1/4 inch and extend not less than 50 mm 2 inches into the walls. Install counterflashing to provide a spring action against base flashing.

3.1.13 Metal Reglets

Calked type or friction type reglets shall be factory fabricated with a minimum opening of 6 mm 1/4 inch and a depth of 30 mm 1 1/4 inches, as approved.

3.1.13.1 Calked Reglets

Provide with rounded edges and metal strap brackets or other anchors for securing to the concrete forms. Provide reglets with a core to protect them from injury during the installation. Provide built-up mitered corner pieces for internal and external angles. Wedge the flashing in the reglets with lead wedges every 450 mm 18 inches, calked full and solid with an approved compound.

3.1.13.2 Friction Reglets

Provide with flashing receiving slots not less than 16 mm 5/8 inch deep, 25 mm one inch jointing tongues, and upper and lower anchoring flanges. Insert the flashing the full depth of the slot and lock by indentations made with a dull-pointed tool.

3.1.14 Polyvinyl Chloride Reglets

Rigid polyvinyl chloride reglets may be provided in lieu of metal reglets for temporary construction.

3.1.15 Gravel Stops and Fascias

NOTE: On projects having smooth surfaced roofs, the upstanding leg of the gravel stop may be omitted. Specify in the appropriate roofing section. Coordinate installation requirements for sheet metal gravel stops and fascias with the referenced roofing section.

Prefabricate in the shapes and sizes indicated and in lengths not less than 2400 mm 8 feet. Extend flange at least 100 mm 4 inches onto roofing. Provide prefabricated, mitered corners internal and external corners. Install gravel stops and fascias after all plies of the roofing membrane have been applied, but before the flood coat of bitumen is applied. Prime roof flange of gravel stops and fascias on both sides with an asphalt primer. After primer has dried, set flange on roofing membrane and strip-in as specified in accordance with roofing manufacturers printed application instructions. Nail flange securely to wood nailer with large-head, barbed-shank roofing nails 38 mm 1.5 inches long spaced not more than 75 mm 3 inches on centers, in two staggered rows.

3.1.15.1 Edge Strip

Hook the lower edge of fascias at least 20 mm 3/4 inch over a continuous strip of the same material bent outward at an angle not more than 45 degrees to form a drip. Nail hook strip to a wood nailer at 150 mm 6 inches maximum on centers. Where fastening is made to concrete or masonry, use screws spaced 300 mm 12 inches on centers driven in expansion shields set in the concrete or masonry. Where horizontal wood nailers are slotted to provide for insulation venting, install strips to prevent obstruction of vent slots. Where necessary, install strips over 2 mm 1/16 inch thick compatible spacer or washers.

3.1.15.2 Joints

Leave open the section ends of gravel stops and fascias 6 mm 1/4 inch and backed with a formed flashing plate, mechanically fastened in place and lapping each section end a minimum of 100 mm 4 inches set laps in plastic cement. Face nailing will not be permitted. Install prefabricated aluminum gravel stops and fascias in accordance with the manufacturer's printed instructions and details.

3.1.16 Metal Drip Edge

Provide a metal drip, designed to allow water run-off to drip free of underlying construction, at eaves and rakes prior to the application of roofing shingles. Apply directly on the wood deck at the eaves and over the underlay along the rakes. Extend back from the edge of the deck not

more than 75 mm 3 inches and secure with compatible nails spaced not more than 250 mm 10 inches on center along upper edge.

3.1.17 Gutters

NOTE: Where it is local practice to omit gutters because of glaciation and ice damage, eave flashing should be provided in accordance with paragraph entitled "Eave Flashing." Confirm preference with local ROICC or Public Works Department.

The hung type of shape indicated and supported on underside by brackets that permit free thermal movement of the gutter. Provide gutters in sizes indicated complete with mitered corners, end caps, outlets, brackets, and other accessories necessary for installation. Bead with hemmed edge or reinforce the outer edge of gutter with a stiffening bar not less than 20 by 5 mm 3/4 by 3/16 inch of material compatible with gutter. Fabricate gutters in sections not less than 2400 mm 8 feet. Lap the sections a minimum of 25 mm one inch in the direction of flow or provide with concealed splice plate 150 mm 6 inches minimum. Join the gutters, other than aluminum, by riveted and soldered joints. Aluminum gutters shall be joined with riveted sealed joints. Provide expansion-type slip joints midway between outlets. Install gutters below slope line of the roof so that snow and ice can slide clear. Support gutters on adjustable hangers spaced not more than 750 mm 30 inches on center or as recommended by the manufacturer. Adjust gutters to slope uniformly to outlets, with high points occurring midway between outlets. Fabricate hangers and fastenings from metals compatible with the gutters.

3.1.17.1 Gutter Expansion Joint

Provide allowance for thermal expansion of gutters by the inclusion of an expansion joint at intervals no greater than 13 meters maximum. Joints may be lap, butt (with splice plate) or separated type.

3.1.17.2 Gutter - Downspout Connection

Connect down spouts to gutters by mechanical (fastener or solder) methods.

3.1.18 Downspouts

NOTE: For additions to existing buildings, downspouts may be specified to match the design of the existing portion of the building.

Types, shapes and sizes are indicated. Provide complete including elbows and offsets. Provide downspouts in approximately 3000 mm lengths. Provide end joints to telescope not less than 13 mm and lock longitudinal joints. Provide gutter outlets with wire ball strainers for each outlet. Provide strainers to fit tightly into outlets and be of the same material used for

gutters. Keep downspouts not less than 25 mm away from walls. Fasten to the walls at top, bottom, and at an intermediate point not to exceed 1500 mm on centers with leader straps or concealed rack-and-pin type fasteners. Form straps and fasteners of metal compatible with the downspouts.

3.1.18.1 Terminations

[Neatly fit into the drainage connection the downspouts terminating in drainage lines and fill the joints with a portland cement mortar cap sloped away from the downspout.] [Provide downspouts terminating in splash blocks with elbow-type fittings. [Concrete splash block is specified in Section 03300, "Cast-In-Place Concrete.]] [Provide splash pans as specified.]

3.1.19 Flashing for Roof Drains

Roof drains are specified in Section: [15400, "Plumbing Systems"]. Provide a 750 mm 30 inch square sheet indicated. Taper insulation to drain from 600 mm 24 inches out. Set flashing on finished felts in a full bed of asphalt roof cement as specified in Roofing Section. Apply strip flashing to the drain flashing in accordance with roofing manufacturers printed application instructions. Heavily coat the drain flashing ring with asphalt roof cement. Clamp the roof membrane, flashing sheet, and stripping felt in the drain clamping ring. Secure clamps so that felts and drain flashing are free of wrinkles and folds.

3.1.20 Scuppers

Line interior of scupper openings with sheet metal. Extend the lining through and project outside of the wall to form a drip on the bottom edge and form to return not less than 25 mm one inch against the face of the outside wall at the top and sides. Fold outside edges under 13 mm 1/2 inch on all sides. Provide the perimeter of the lining approximately 13 mm 1/2 inch less than the perimeter of the scupper. Join the top and sides of the lining on the roof deck side to a closure flange by a locked and soldered joint. Join the bottom edge by a locked and soldered joint to the closure flange, where required, form with a ridge to act as a gravel stop around the scupper inlet. Provide surfaces to receive the scupper lining and coat with bituminous plastic cement. Mechanically fasten joints in aluminum and seal.

3.1.21 Conductor Heads

Type indicated and fabricated of the same material as the downspouts. Set the depth of top opening equal to two-thirds of the width. Provide outlet tubes not less than 100 mm 4 inches long. Flat-lock solder the seams except the mechanically fastened aluminum joints filled with a hard setting sealant. Where conductor heads are used in conjunction with scuppers, set the conductor a minimum of 50 mm 2 inches wider than the scupper. Attach conductor heads to the wall with masonry fasteners, and loose-lock to provide conductor heads with screens of the same material. Securely fasten screens to the heads.

3.1.22 Splash Pans

Install splash pans where downspouts discharge on roof surfaces and at other locations as indicated. Unless otherwise shown, provide pans not less than 600 mm long by 450 mm wide 24 inches long by 18 inches wide with metal ribs across the bottom of the pan. Form the sides of the pan with vertical baffles not less than 25 mm one inch high in the front, and 100 mm 4 inches high in the back doubled over and formed continuous with horizontal roof flanges not less than 100 mm 4 inches wide. Bend the rear flange of the pan to contour of cant strip and extend up 150 mm 6 inches under the side wall covering or to height of base flashing under counterflashing. Bed the pans and roof flanges in plastic bituminous cement and strip-flash as specified in Roofing Section.

3.1.23 Open Valley Flashing

[Provide valley flashing free of longitudinal seams, of width sufficient to extend not less than 150 mm 6 inches under the roof covering on each side. Provide a 13 mm 1/2 inch fold on each side of the valley flashing. Lap the sheets not less than 150 mm 6 inches in the direction of flow and secure to roofing construction with cleats attached to the fold on each side. Nail the tops of sheets to roof sheathing. Space the cleats not more than 300 mm 12 inches on centers. Provide exposed flashing not less than 100 mm 4 inches in width at the top and increase 25 mm one inch in width for each additional 2400 mm 8 feet in length. Where the slope of the valley is one in 2.67 or less 4.5 inches or less per foot, or the intersecting roofs are on different slopes, provide an inverted V-joint, 25 mm one 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.] [Valley flashing for asphalt shingle roofs is specified in Section 07311, "Asphalt Shingles."]

3.1.24 Eave Flashing

One piece in width, applied in 2400 to 3000 mm 8 to 10 foot lengths with expansion joints spaced as specified in paragraph entitled "Expansion and Contraction." Provide a 20 mm 3/4 inch continuous fold in the upper edge of the sheet to engage cleats spaced not more than 250 mm 10 inches on centers. Locate the upper edge of flashing not less than 450 mm 18 inches from the outside face of the building, measured along the roof slope. Fold lower edge of the flashing over and loose-lock into a continuous edge strip on the fascia. Where eave flashing intersects metal valley flashing, secure with 25 mm one inch flat locked joints with cleats that are 250 mm 10 inches on centers. Place eave flashing over underlayment and in plastic bituminous cement.

3.1.25 Sheet Metal Covering on Flat, Sloped, or Curved Surfaces

Except as specified or indicated otherwise, cover and flash all minor flat, sloped, or curved surfaces such as crickets, bulkheads, dormers and small decks with metal sheets of the material used for flashing; maximum size of sheets, 375 by 455 mm 16 by 18 inches. Fasten sheets to sheathing with metal cleats. Lock seams and solder. Lock aluminum seams and fill with sealer as recommended by aluminum manufacturer. Provide an underlayment of building paper for all sheet metal covering.

3.1.26 Expansion Joints

NOTE: The contract drawings should contain details of building expansion joints at walls, ceiling, floors, roof, and parapets. Include exterior and interior details. Provide isometric detailing for expansion joints intersections.

Provide expansion joints for roofs, walls, and floors where indicated and conform to the requirements of Table I.

3.1.26.1 Roof Expansion Joints

Consist of curb with wood nailing members on each side of joint, bituminous base flashing, metal counterflashing, and metal joint cover. Bituminous base flashing is specified in Roofing Section. Provide counterflashing as specified in paragraph "Counterflashing," except as follows: Provide counterflashing with vertical leg of suitable depth to enable forming into a horizontal continuous cleat. Secure the inner edge to the nailing member. Make the outer edge projection not less than 25 mm one inch for flashing on one side of the expansion joint and be less than the width of the expansion joint plus 25 mm one inch for flashing on the other side of the joint. Hook the expansion joint cover over the projecting outer edges of counterflashing. Provide roof joint with a joint cover of the width indicated. Hook and lock one edge of the joint cover over the shorter projecting flange of the continuous cleat, and the other edge hooked over and loose locked with the longer projecting flange. Joints are specified in Table II.

3.1.26.2 Floor and Wall Expansion Joints

Provide U-shape with extended flanges for expansion joints in concrete and masonry walls and in floor slabs. Cover plates for wall and floor joints are specified in Section [05500, "Metal Fabrications."] [_____].

3.1.27 Flashing at Roof Penetrations and Equipment Supports

Provide metal flashing for all pipes, ducts, and conduits projecting through the roof surface and for equipment supports, guy wire anchors, and similar items supported by or attached to the roof deck. Rainhoods, power roof ventilators, and [_____] are specified in Section [_____, "_____"].

3.1.27.1 Single Pipe Vents

See Table I, footnote (d). Set flange of sleeve in bituminous plastic cement and nail 75 mm 3 inches on centers. Bend the top of sleeve over and extend down into the vent pipe a minimum of 50 mm 2 inches. For long runs or long rises above the deck, where it is impractical to cover the vent pipe with lead, use a two-piece formed metal housing. Set metal housing with a metal sleeve having a 100 mm 4 inch roof flange in bituminous plastic cement and nailed 75 mm 3 inches on centers. Extend sleeve a minimum of 200 mm 8 inches above the roof deck and lapped a minimum of 75 mm 3 inches by a metal hood secured to the vent pipe by a draw band. Seal the

area of hood in contact with vent pipe with an approved sealant. Sealants are covered under Section 07920, "Joint Sealants."

3.1.28 Copings

Provide coping using sheets 2400 or 3000 mm long joined by a 20 mm locked and soldered seam. Terminate outer edges in edge strips. Install with sealed [lap joints] [cover plate joints] as indicated.

3.2 PAINTING

Field-paint sheet metal for separation of dissimilar materials. [Finish painting is specified in Section 09900, "Paints and Coatings."]

3.3 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

3.4 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

3.5 [FIELD QUALITY CONTROL

Establish and maintain a record of the work Quality Control Plan for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements.]

3.5.1 Procedure

Submit for approval prior to start of roofing work. Include a checklist of points to be observed by the ROICC and roofing materials manufacturer. The roofing manufacture shall visit the site before, during and after the flashing installation to assure compliance with manufactures requirements. Document the actual quality control observations and inspections. Furnish a copy of the documentation to the Contracting Officer at the end of each day.

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES

Sheet Metal Items	[Copper, kilograms Per Square meter]	[Aluminum, mm]	[Stainless Steel, mm]	[Zinc- Coated Steel, mm]
[Building Expansion Joints]				
[Cover].....	4.9	0.81	0.39	0.6
[Waterstop-bellows or flanged, U-type.]....	4.9	-	0.39	-
[Covering on minor flat, pitched or curved surfaces].....	6.125	1.02	0.46	-
[Downspouts and leaders].....	4.9	0.81	0.39	0.6
[Downspout clips and anchors].....	-	1.02 clip	-	-
	-	3.175 anchor	-	-
[Downspout straps, 50 mm].....	14.7(a)	1.52	1.27	-
[Conductor heads].....	4.9	0.81	0.39	-
[Scupper lining].....	6.125	0.81	0.39	-
[Strainers, wire diameter or gage]....	4.0	3.66	2.77	-
	gage	diameter	diameter	
[Flashings:]				
[Base].....	6.125	1.02	0.46	0.6
[Cap (Counter-flashing)]	4.9	0.81	0.39	0.5
[Eave].....	4.9	-	0.39	0.6
[Spandrel beam].....	3.1	-	0.25	-
[Bond barrier].....	4.9	-	0.39	-
[Stepped].....	4.9	0.81	0.39	-
[Valley].....	4.9	0.81	0.39	-
[Roof drain].....	4.9(b)			
[Pipe vent sleeve(c)]				
[Coping].....	4.9	1.0	.58	.58
[Gravel stops and fascias:]				
[Extrusions].....	-	1.91	-	-
[Sheets, corrugated].....	4.9	0.81	0.39	-
[Sheets, smooth].....	6.125	1.27	0.46	0.6
[Edge strip].....	7.35	1.27	0.635	-
[Gutters:]				
Gutter section.....	4.9	0.81	0.39	0.6
Continuous cleat.....	4.9	0.81	0.39	0.6
Hangers, dimensions].....	25 mm x	25 mm x	25 mm x	-

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES

Sheet Metal Items	[Copper, kilograms Per Square meter]	[Aluminum, mm]	[Stainless Steel, mm]	[Zinc-Coated Steel, mm]
	3 mm (a)	2 mm (c)	one mm	
[Joint Cover plates... (See Table II)]	4.9	0.81	0.39	0.6
[Reglet.....]	3.1	-	0.25	-
[Splash pans].....	4.9	1.02	0.46	-

(a) Brass.

(b) May be lead weighing 19.6 kilograms per square meter.

(c) 12.25 kilogram minimum lead sleeve with 100 mm flange. Where lead sleeve is impractical, refer to paragraph entitled "Single Pipe Vents" for optional material.

NOTE: Thickness and weights indicated are for coping sections framed to cap a maximum wall width of 460 mm. Wall widths wider than 460 mm or fascia leg heights greater than 250 mm may require greater metal thickness.

NOTE: Thickness and weights indicated are for gutter sections fabricated from uniformed metal stock up to 380 mm in width. Gutters formed from wider metal stock need to increase thickness or weights of materials specified.

TABLE II. SHEET METAL JOINTS
 TYPE OF JOINT

Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Joint cap for	30 mm single lock, standing	30 mm single lock,	- - -

TABLE II. SHEET METAL JOINTS
TYPE OF JOINT

Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
building expansion	seam, cleated	standing	
joint at roof	seam, cleated		
Flashings			
Base	25 mm 75 mm lap for expansion joint	25 mm flat locked, soldered; sealed; 75 mm lap for expansion joint	Aluminum producer's recommended hard setting sealant for locked aluminum joints. Fill each metal expansion joint with a joint sealing compound compound. See Section 07920, "Joint Sealants."
Cap-in reglet	75 mm lap	75 mm lap	Seal groove with joint sealing compound. See Section 07920, "Joint Sealants."
Reglets	Butt joint	- - -	Seal reglet groove with joint sealing compound. See Section 07920, "Joint Sealants."
Eave	25 mm flat locked, cleated. 25 mm loose locked, sealed expansion joint, cleated	25 mm flat locked, locked, cleated 25 mm loose locked, sealed expansion joints, cleated	Same as base flashing.
Stepped	75 mm lap	75 mm lap	- - -

TABLE II. SHEET METAL JOINTS
TYPE OF JOINT

Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Valley.	150 mm lap cleated	150 mm lap cleated	- - -
Edge strip	Butt	Butt	- - -
Gravel stops:			
Extrusions	- - -	Butt with 13 mm	Use sheet flashing space beneath and a cover plate.
Sheet, smooth	Butt with 6 mm space	Butt with 6 mm space	Use sheet flashing backup plate.
Sheet corrugated	Butt with 6 mm space	Butt with 6 mm space	Use sheet flashing beneath and a cover gated plate or a combination unit
Gutters	40 mm lap, riveted and soldered	25 mm flat locked, riveted, and sealed	Aluminum producers recommended hard setting sealant for locked aluminum joints.

(a) Elastomeric flashing shall have 75 mm lap with manufacturer's recommended sealant.

TABLE II. SHEET METAL JOINTS
 TYPE OF JOINT

Item Designation	Material	Remarks
	Copper, Terne-Coated	
	Stainless	
	Steel, Zinc-Coated	
	Steel and Stainless	
	Steel	
	Aluminum	

NOTE: Suggestions for improvement of this specification will be welcomed using the Navy "Change Request Forms" subdirectory located in SPECSINTACT in Jobs or Masters under "Forms/Documents" directory or DD Form 1426. Suggestions should be forwarded to:

Commanding Officer
 Seabee Logistics Center
 NAVFAC 15G/CESO 15E
 4111 San Pedro Street
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