

Philadelphia VA Medical Center  
Replacement of AC-19 and Laboratory  
Renovation  
Philadelphia, PA 19104

April 12, 2012  
Issued for Bid  
VA Project No. VA244-P-1786  
Array Project No. 3515

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Formed sheet metal work for wall and roof flashing are specified in this section.

1.2 RELATED WORK

- A. Manufactured flashing: Section 07 71 00 ROOF SPECIALTIES.
- B. Membrane base flashings and stripping: Section 07 51 00, BUILT-UP BITUMINOUS ROOFING.
- C. Joint Sealant: Section 07 92 00, JOINT SEALANTS.
- D. Integral flashing component of manufactured roof specialties and accessories or equipment: Section 07 71 00, ROOF SPECIALTIES, Division 22, PLUMBING sections and Division 23 HVAC sections.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below for a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. Aluminum Association (AA):
  - 1. AA-C22A41 Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick.
  - 2. AA-C22A42 Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick.
  - 3. AA-C22A44 Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class I Architectural, 0.7-mil thick finish.
- C. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
  - 1. ANSI/SPRI ES-1-03 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.
- D. American Architectural Manufacturers Association (AAMA):
  - 1. AAMA 620 Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum.
  - 2. AAMA 621 Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
- E. ASTM International (ASTM):
  - 1. A167-99(R 2009) Stainless and Heat-Resisting Chromium-Nickel

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Steel Plate, Sheet, and Strip

2. A653/A653M-09 Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process
  3. B32-04 Solder Metal
  4. B209-07 Aluminum and Aluminum-Alloy Sheet and Plate
  5. B370-03 Copper Sheet and Strip for Building Construction
  6. D173-03 Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing
  7. D412-06 Vulcanized Rubber and Thermoplastic Elastomers-Tension
  8. D1187-97 (R2002) Asphalt Base Emulsions for Use as Protective Coatings for Metal
  9. D1784-08 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
  10. D3656-07 Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
  11. D4586-07 Asphalt Roof Cement, Asbestos Free
- F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.
- G. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500-06 Metal Finishes Manual
- H. Federal Specification (Fed. Spec):
1. A-A-1925A Shield, Expansion; (Nail Anchors)
  2. UU-B-790A Building Paper, Vegetable Fiber
- I. International Code Commission (ICC): International Building Code, Current Edition

1.4 PERFORMANCE REQUIREMENTS

- A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
1. Wind Zone 2: 1.48 to 2.15 kPa (31 to 45 lbf/sq. ft.): 4.31-kPa (90-lbf/sq. ft.) perimeter uplift force, 5.74-kPa (120-lbf/sq. ft.) corner uplift force, and 2.15-kPa (45-lbf/sq. ft.) outward force.
- B. Wind Design Standard: Fabricate and install [copings] [roof-edge flashings tested per ANSI/SPRI ES-1 to resist design pressure [insert design pressure] [indicated on Drawings].

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: For all specified items, including:
1. Flashings
  2. Copings
- C. Manufacturer's Literature and Data: For all specified items, including:

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1. Two-piece counterflashing
2. Thru wall flashing
- D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

## PART 2 - PRODUCTS

### 2.1 FLASHING AND SHEET METAL MATERIALS

- A. Stainless Steel: ASTM A167, Type 302B, dead soft temper.
- B. Copper ASTM B370, cold-rolled temper.

### 2.2 FLASHING ACCESSORIES

- A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.
- B. Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m<sup>2</sup> ( 6 lbs/100 sf).
- C. Bituminous Paint: ASTM D1187, Type I.
- D. Fasteners:
  1. Use copper, copper alloy, bronze, brass, or stainless steel for copper and copper clad stainless steel, and stainless steel for stainless steel.
  2. Nails:
    - a. Minimum diameter for copper nails: 3 mm (0.109 inch).
    - b. Minimum diameter for aluminum nails 3 mm (0.105 inch).
    - c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
    - d. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.
  3. Rivets: Not less than 3 mm (1/8 inch) diameter.
  4. Expansion Shields: Fed Spec A-A-1925A.
- E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.
- F. Insect Screening: ASTM D3656, 18 by 18 regular mesh.
- G. Roof Cement: ASTM D4586.

### 2.3 SHEET METAL THICKNESS

- A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:
- B. Concealed Locations (Built into Construction):
  1. Copper: 30g (10 oz) minimum 0.33 mm (0.013 inch thick).
  2. Stainless steel: 0.25 mm (0.010 inch) thick.
  3. Copper clad stainless steel: 0.25 mm (0.010 inch) thick.
- C. Exposed Locations:

1. Copper: 0.4 Kg (16 oz).
2. Stainless steel: 0.4 mm (0.015 inch).
3. Copper clad stainless steel: 0.4 mm (0.015 inch).

## 2.4 FABRICATION, GENERAL

### A. Jointing:

1. In general, copper, stainless steel and copper clad stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
2. Jointing of copper over 0.5 Kg (20 oz) weight or stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
3. Joints shall conform to following requirements:
  - a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.
  - b. Lap joints subject to stress shall finish not less than 25 mm (1 inch) wide and shall be soldered and riveted.
  - c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.
4. Flat and lap joints shall be made in direction of flow.
5. Edges of bituminous coated copper, copper covered paper, nonreinforced elastomeric sheeting and polyethylene coated copper shall be jointed by lapping not less than 100 mm (4 inches) in the direction of flow and cementing with asphalt roof cement or sealant as required by the manufacturer's printed instructions.
6. Soldering:
  - a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1-1/2 inches) of uncoated copper, stainless steel, and copper clad stainless steel.
  - b. Wire brush to produce a bright surface before soldering lead coated copper.
  - c. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
  - d. Completely remove acid and flux after soldering is completed.

### B. Cleats:

1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

C. Edge Strips or Continuous Cleats:

1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.
2. Except as otherwise specified, fabricate edge strips or minimum 0.6 mm (0.024 inch) thick stainless steel.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4 inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using[ 1 Kg (32 oz) copper][ 0.8 mm (0.031 inch) thick stainless steel][ 1.6 mm (0.0625 inch) thick aluminum].

D. Drips:

1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

E. Edges:

1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
3. All metal roof edges shall meet requirements of IBC, current edition.

F. Metal Options:

1. Where options are permitted for different metals use only one metal throughout.
2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.

2.5 FINISH

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual, unless otherwise specified.
- C. Finish exposed metal surfaces as follows, unless specified otherwise:
  1. Copper: Mill finish.
  2. Stainless Steel: Finish No. 2B or 2D.

## 2.6 THROUGH-WALL FLASHINGS

### A. Window Sill Flashing:

1. Use either copper, stainless steel, copper clad stainless steel plane flat sheet, or nonreinforced elastomeric sheeting, bituminous coated copper, copper covered paper, or polyethylene coated copper.
2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
3. Turn up back edge as shown.
4. Form exposed portion with drip as specified or receiver.

## 2.7 BASE FLASHING

### A. Use metal base flashing at vertical surfaces intersecting built-up roofing without cant strips or where shown.

1. Use either copper, or stainless steel, thickness specified unless specified otherwise.
2. When flashing is over 250 mm (10 inches) in vertical height or horizontal width use either Kg (20 oz) copper or 0.5 mm (0.018 inch) stainless steel.
3. Use stainless steel at aluminum roof curbs where flashing contacts the aluminum.
4. Use either copper, or stainless steel at pipe flashings.

### B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).

### C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.

### D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.

### E. Pipe Flashing: (Other than engine exhaust or flue stack)

1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
  - a. Form top of sleeve to turn down into the pipe at least 25 mm (1 inch).
  - b. Allow for loose fit around and into the pipe.
4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
  - a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
  - b. Allow for loose fit around pipe.

## 2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)

### A. Either copper or stainless steel, unless specified otherwise.

- B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:
1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
  2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
  3. Two-piece, lock in type flashing may be used in-lieu-of one piece counterflashing.
  4. Manufactured assemblies may be used.
  5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
  6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.
- C. One-piece Counterflashing:
1. Back edge turned up and fabricate to lock into reglet in concrete.
  2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).
- D. Two-Piece Counterflashing:
1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
  2. Counterflashing upper edge designed to snap lock into receiver.
- E. Surface Mounted Counterflashing; one or two piece:
1. Use at existing or new surfaces where flashing can not be inserted in vertical surface.
  2. One piece fabricate upper edge folded double for 65 mm (2-1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.
  3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.
- F. Pipe Counterflashing:
1. Form flashing for watertight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
  2. Fabricate 100 mm (4 inch) over lap at end.
  3. Fabricate draw band of same metal as counter flashing. Use 0.6 Kg (24 oz) copper or 0.33 mm (0.013 inch) thick stainless steel or copper coated stainless steel.

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4. Use stainless steel bolt on draw band tightening assembly.
5. Vent pipe counter flashing may be fabricated to omit draw band and turn down 25 mm (1 inch) inside vent pipe.
- G. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

## 2.9 HANGING GUTTERS

1. Gutter Brackets: [[ 5 mm x 25 mm ][6 mm x 25 mm][ (3/16 by 1 inch) ][( 1/4 by 1 inch) aluminum].

## PART 3 - EXECUTION

### 3.1 INSTALLATION

#### A. General:

1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.
8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.



12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
  - a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
  - b. Paint dissimilar metal with a coat of bituminous paint.
  - c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
  - a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
  - b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

### 3.2 THROUGH-WALL FLASHING

#### A. Window Sill Flashing:

1. Install flashing to extend not less than 100 mm (4 inch) beyond ends of sill into vertical joint of masonry or veneer.
2. Turn back edge up to terminate under window frame.
3. Turn ends up 25 mm (1 inch) and fold corners to form dam and extend to face of wall.

### 3.3 BASE FLASHING

#### A. Install where roof membrane type base flashing is not used and where shown.

1. Install flashing at intersections of roofs with vertical surfaces or at penetrations through roofs, to provide watertight construction.
2. Install metal flashings and accessories having flanges extending out on top of the built-up roofing before final bituminous coat and roof aggregate is applied.
3. Set flanges in heavy trowel coat of roof cement and nail through flanges into wood nailers over bituminous roofing.
4. Secure flange by nailing through roofing into wood blocking with nails spaced 75 mm (3 inch) on centers or, when flange over 100 mm (4 inch) wide terminate in a 13 mm (1/2 inch) folded edge anchored with cleats

spaced 200 mm (8 inch) on center. Secure one end of cleat over nail heads. Lock other end into the seam.

- B. For long runs of base flashings install in lengths of not less than 2400 mm (8 feet) nor more than 3000 mm (10 feet). Install a 75 mm (3 inch) wide slip type, loose lock expansion joint filled with sealant in joints of base flashing sections over 2400 mm (8 feet) in length. Lock and solder corner joints at corners.
- C. Extend base flashing up under counter flashing of roof specialties and accessories or equipment not less than 75 mm (3 inch).

### 3.4 COUNTERFLASHING (CAP FLASHING OR HOODS)

#### A. General:

- 1. Install counterflashing over and in conjunction with installation of base flashings, except as otherwise specified or shown.
- 2. Install counterflashing to lap base flashings not less than 100 mm (4 inch).
- 3. Install upper edge or top of counterflashing not less than 225 mm (9 inch) above top of the roofing.
- 4. Lap joints not less than 100 mm (4 inch). Stagger joints with relation to metal base flashing joints.
- 5. Use surface applied counterflashing on existing surfaces and new work where not possible to integrate into item.

#### B. One Piece Counterflashing:

- 1. Where flashing is surface mounted on flat surfaces.
  - a. When top edge is double folded anchor flat portion below sealant "V" joint with fasteners spaced not over 400 mm (16 inch) on center:
    - 1) Locate fasteners in masonry mortar joints.
    - 2) Use screws to sheet metal or wood.
  - b. Fill joint at top with sealant.
- 2. Where flashing or hood is mounted on pipe.
  - a. Secure with draw band tight against pipe.
  - b. Set hood and secure to pipe with a one by 25 mm x 3 mm (1 x 1/8 inch) bolt on stainless steel draw band type clamp, or a stainless worm gear type clamp.
  - c. Completely fill joint at top with sealant.

#### C. Two-Piece Counterflashing:

- 1. Surface applied type receiver:
  - a. Secure to face construction in accordance, with manufacturers instructions.
  - b. Completely fill space at the top edge of receiver with sealant.
- 2. Insert counterflashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.

#### D. Where vented edge occur install so lower edge of counterflashing is against

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base flashing.

E. When counterflashing is a component of other flashing install as shown.

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