

## STANDING SEAM SHEET METAL ROOFING

### GENERAL INFORMATION

- 1.1 For all standing seam metal roofing work consult Columbia University Facilities Exteriors and Historic Preservation group.
- 1.2 Fabricator is responsible for installing system, including anchorage to substrate and necessary modifications in accordance with the “Copper in Architecture” handbook published by the Copper Development Association Inc. (CDA):
  - a. Drawings are diagrammatic and are intended to establish basic dimension of units, sight lines, and profiles of units.
  - b. Make modifications only to meet field conditions and to ensure fitting of system components.
  - c. Obtain approval for any deviation from the drawings and specifications.
  - d. Provide concealed fastening wherever possible.
  - e. Attachment considerations: Account for site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening and fracturing connection between units and building structure or between components themselves.
  - f. Obtain Architect’s approval for connections to building elements at locations other than indicated in Drawings.
  - g. Accommodate building structure deflections in system connections to structure.
- 1.3 Require the following Quality Assurance provisions:
  - a. Fabricator's Qualifications: Company specializing in copper sheet metal roofing work with three years experience in similar size and type of installations.
  - b. Installer: A firm with 3 years of successful experience with installation of copper roofing of type and scope equivalent to Work of this Section.

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- c. Industry Standard: Except as otherwise shown or specified, comply with applicable recommendations and details of the "Copper in Architecture" handbook published by the Copper Development Association Inc. (CDA). Conform to dimensions and profiles shown.
  - d. Wind Uplift: Provide roof assemblies meeting wind uplift ratings as required by code.
  - e. Mock-Up: Before proceeding with final purchase of materials and fabrication of copper roofing components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements. Install mock-up at roof area location directed by Architect. Retain accepted mock-up as quality standard for acceptance of completed copper roofing. If accepted, mock-up may be incorporated as part of copper roofing work. Provide mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and color.
- 1.4 Warranty:
- a. Warrant installed system and components to be free from defects in material and workmanship for period of 2 years.
  - b. Include coverage against leakage and damages to finishes.
- 1.5 Performance Requirements:
- a. System shall accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to seasonal temperature changes and live loads.
  - b. Design system capable of withstanding building code requirements for negative wind pressure.
- 1.6 Interface With Adjacent Systems:
- a. Integrate design and connections with adjacent construction.
  - b. Accommodate allowable tolerances and deflections for structural members in installation.
- 1.7 Submit: Product data including metal manufacturer's specifications, installation instructions, and general recommendations for roofing applications. Include certification or other data substantiating that materials comply with requirements; Shop drawings showing manner of forming, joining, and securing copper roofing, and pattern of seams. Show expansion joint details and waterproof connections to adjoining work and at obstructions and penetrations; Samples consisting of 6-inch (150 mm) or 12-inch (300 mm) square specimens of specified copper roofing

material; Fabricator's certification that products furnished for Project meets or exceeds specified requirements; Maintenance data in Operations and Maintenance manual for maintaining applied coatings on copper panels.

## DESIGN REQUIREMENTS

### 2.1 Materials:

- a. Copper Roofing Sheets: Cold-rolled copper sheet complying with ASTM B 370 temper H00, unless otherwise indicated, 20 oz. per sq. ft. (0.0270-inch thick) (0.69-mm) unless otherwise indicated.
- b. Miscellaneous Materials: Specify materials and types of fasteners, solder, protective coatings, separators, sealants and accessory items as recommended by copper sheet manufacturer for copper roofing work, except as otherwise indicated.

### 2.2 Accessories: Except as indicated as work of another specification Section, specify components required for a complete roof system, including trim, copings, fascias, ridge closures, cleats, seam covers, battens, flashings, gutters, louvers, sealants, gaskets, and closure strips. Match materials and finishes of roof. Accessories include:

- a. Sealing tape: Pressure-sensitive 100 percent solids polyisobutylene compound sealing tape with release paper backing; permanently elastic, nonsag, nontoxic, nonstaining).
- b. Joint Sealant: One-part, copper compatible elastomeric polyurethane, polysulfide, butyl or silicone rubber sealant as tested by sealant manufacturer for copper substrates. Refer to Division 07.
- c. Cleats: Concealed type as indicated in the "Copper in Architecture " handbook published by the Copper Development Association Inc. (CDA) for standing seams. Fabricate cleats to allow thermal movement of copper roof panels while preventing copper panel distortion due to wind uplift forces.
- d. Trim, Closure Pieces, and Accessories: Same material, thickness, and finish as adjacent copper roof panels, brake formed to required profiles. Comply with standards conforming to recognized industry standard sheet metal practice.
- e. Bituminous Coating: SSPC-Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film), nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

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- f. Roofing Felt Underlayment: Asphalt saturated felt weighing not less than 30 lbs per 100 square feet.
  - g. Paper Slip Sheet: Minimum 4-lb. red rosin-sized building paper.
  - h. Nails for Wood Substrates: Copper or hardware bronze, 0.109-inch minimum not less than 7/8-inch (22-mm) long barbed with large head.
  - i. Screws & Bolts: Copper, bronze, brass, or passivated stainless steel (300 Series) of sufficient size and length to sustain imposed stresses .
  - j. Cleats: 16 or 20 oz ounce cold rolled copper, as required to sustain loads 2-inch (50 mm) wide x 3-inch (75-mm) long.
  - k. Solder: ASTM B32; Provide 50-50 tin/lead or lead free alternative of similar or greater strength solder. Killed acid flux.
  - l. Flux: Muriatic acid neutralized with zinc or approved brand of soldering flux.
  - m. Rivets: 1/8-inch (3-mm) to 3/16-inch (4.5-mm) diameter, with solid brass mandrels. Provide solid copper rivet (tinner's rivets) where structural integrity of seam is required.
- 2.3 General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of the "Copper in Architecture" handbook and other recognized industry practices. Fabricate for waterproof and weather-resistant performance with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrate. Comply with material manufacturer's instructions and recommendations for forming material. Form exposed copper work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- a. Fabricate to allow for adjustments in field for proper anchoring and joining.
  - b. Form sections true to shape, accurate in size, square, free from distortion and defects.
  - c. Cleats: Fabricate cleats and starter strips of same material as sheet, interlockable with sheet in accordance with CDA recommendations.
  - d. Tin edges of copper sheets and cleats at soldered joints for flat lock and soldered system.

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- e. Standing Seam Panels: Fabricate pans to interlock standing seam with center to center seam spacing as indicated on Drawings. Fabricate interlocking seams to heights and patterns indicated. Form overlapping and interlocking transverse joints.
  - f. Seams: Fabricate nonmoving seams in copper sheet with flat-lock seams. Tin edges and cleats to be soldered, form seams, and solder.
  - g. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch (25-mm) deep, filled with mastic sealant (concealed within joints).
  - h. Sealant Joints: Where movable, non-expansion-type joints are indicated or required for proper performance of work, form copper to provide for proper installation of elastomeric sealant, in compliance with the "Copper in Architecture" handbook published by the Copper Development Association Inc. (CDA) .
  - i. Separations: Provide for separation of copper from noncompatible metal or corrosive substrate by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
  - j. Solder: Solder and seal non-moving copper joints on slopes up to 3:12, except those indicated or required to be expansive type joints. After soldering, remove flux. Wipe and wash solder joints clean. Refer to CLEANING Article in PART 3.
- 2.4 Natural weathering mill finished copper. No applied finish.

## CONSTRUCTION REQUIREMENTS

- 3.1 Examination:
- a. General: Examine conditions and proceed with work when substrates are ready.
  - b. Confirm that substrate system is even, smooth, sound, clean, dry, and free from defects.
  - c. Verify roof openings, pipes, sleeves, ducts, and vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.

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- 3.2 Coordinate copper roofing with rain drainage work, flashing, gutters, downspouts, trip and construction of decks, parapets, walls, and other adjoining work to provide permanently watertight, secure, and noncorrosive installation.
- 3.3 Delivery, Storage, and Handling
- a. Packing, Shipping, Handling, and Unloading: Protect finish panel faces.
  - b. Acceptance at Site: Examine each panel and accessory as delivered and confirm that finish is undamaged. Do not accept or install damaged panels.
- 3.4 Storage and Protection: Stack pre-formed material to prevent twisting, bending, and abrasions; provide ventilation; prevent contact with materials which may cause discoloration or staining.
- 3.5 Preparation:
- a. Clean surfaces to receive copper roofing. Substrate to be smooth and free of defects. Drive all projecting nails or other fasteners flush with substrate.
  - b. Roofing Felt Underlayment: Install underlayment over solid substrates with horizontal overlaps and endlaps staggered. Lay parallel to ridge line with 2 ½-inch (63-mm) sidelaps and 6-inch (150-mm) endlaps. Start application at low point, working up deck laying plies in shingle fashion. Fasten underlayment with copper roofing nails spaced on 12-inch (300-mm) centers maximum.
  - c. Install underlayment and paper slip sheet on substrate under copper roofing to greatest extent possible unless otherwise recommended by manufacturer of sheet metal. Paper slip sheets must be installed over the underlayment. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under copper roofing. Lap joints 2 inch (50 mm) minimum.
- 3.6 Installation:
- a. Manufacturer's Recommendations: Except as otherwise shown or specified, comply with recommendations and instructions of manufacturer of copper being fabricated and installed.
  - b. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized asphalt or butyl underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
  - c. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of copper roofing to profiles, patterns, and drainage arrangements shown and as required for permanently leakproof construction. Provide for

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thermal expansion and contraction of the work, as indicated. Seal joints as shown and as required for leakproof construction. Shop-fabricate materials to greatest extent possible.

- d. Sealant-Type Joints: Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to conceal sealant completely. When ambient temperature is moderate at time of installation, 40 degrees to 70 degrees F (4 degrees to 21 degrees C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher or lower ambient temperatures. Do not install sealant-type joints at temperatures below 40 degrees F (4 degrees C). Comply with requirements of Division 07 "Joint Sealant" Sections for handling and installing sealants.
- e. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, and sealant. Except as otherwise shown, fold back sheet metal to form a hem on concealed side of exposed edges.
- f. Conceal fasteners and expansion provisions where possible in exposed work, and locate so as to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- g. Tin uncoated copper surfaces and cleats at edges of sheets to be soldered, for a width of 1-1/2 inch (38 mm), using solder recommended for copper work.
- h. Standing Seam Roofing:
  - i. Fold lower end of each pan under 3/4 inch (19 mm). Slit fold 1-inch (25-mm) away from corner to form tab where pan turns up to make standing seam. Fold upper end of each pan over 2-inches (50 mm). Hook fold on lower end of upper pan into fold on upper end of underlying pan.
  - j. Apply pans beginning at eaves. Loose lock pans to valley flashing and edge strips at eaves and gable rakes.
  - k. Finish standing seams one inch (25-mm) 1 1/2-inch (38mm)] high. Bend up one side edge 1 1/2-inch (38-mm) [2-inch (50-mm)] and other 1-3/4 inch (44 mm) [2-1/4 (66mm)]. Make first fold 1/4-inch (6-mm) wide single fold and second fold 1/2-inch (13-mm) wide, providing locked portion of standing seam with 5 plies in thickness. Fold lower ends of seams at eaves over at 45 degree angle. Terminate standing seams at ridge and hips by turning down in tapered fold.

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- l. Form valleys of sheets not exceeding 10'-0" (3000-mm) in length. Lap joints 8-inches (200 mm) in direction of drainage. Extend valley sheet minimum 6-inches (150-mm) under roofing sheets. At valley, double fold valley and roofing sheets and secure with cleats spaced 12-inch (300-mm) centers.
  - m. Coordinate installation of panels with adjacent construction to ensure watertight enclosure.
- 3.7 Cleaning:
- a. Remove protective film (if any) from exposed surfaces of copper roofing promptly upon installation. Strip with care to avoid damage to finishes.
  - b. Upon completion of each area of soldering, carefully remove flux and other residue from surfaces. Neutralize acid flux by washing with baking soda solution, and then flushing clear water rinse. Use special care to neutralize and clean crevices.
  - c. Clean exposed metal surfaces of substances that would interfere with uniform oxidation and weathering.
- 3.5 Protection: Provide final protection in a manner acceptable to installer that ensures that copper roofing is without damage or deterioration at time of Substantial Completion.

**REFERENCE**

- 4.1 The applicable CSI Specification Section is 07 61 13.