SECTION 07 61 00

SHEET METAL ROOFING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Copper sheet roofing.

B. Copper gutters, down spouts.

C. Copper flashing and trim.

1.02 MEASUREMENT AND PAYMENT

A. Measurement: Copper roofing, including gutters, downspouts, and related flashings, will be measured for payment by the lump-sum method, acceptably furnished and installed.

B. Payment: Copper roofing, including gutters, downspouts, and related flashings, will be paid for at the Contract lump-sum price as indicated in the Bid Schedule of the Bid Form.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1.	ASTM B29	Standard Specification for Refined Lead
2.	ASTM B32	Standard Specification for Solder Metal
3.	ASTM B370	Standard Specification for Copper Sheet and Strip for Building Construction
4.	ASTM C920	Standard Specification for Elastomeric Joint Sealant
5.	ASTM D2178/D2178M	Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing

B. Federal Specification (FS):

1.	TT-S-230	Sealing Compound: Elastomeric Type, Single Component, Chemically Curing (For Caulking, Sealing, and Glazing in Buildings and Other Structures)
2.	TT-S-1543	Sealing Compound: Silicone Rubber Base (For Caulking, Sealing, and Glazing in Buildings and Other Structures)
3.	UU-B-790	Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent and Fire Resistant)

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

1. SMACNA Architectural Sheet Metal Manual

D. Underwriters Laboratories Inc. (UL)

1. UL 580 Standard for Safety Tests for Uplift Resistance of Roof Assemblies

2. UL 790 Standard for Standard Test Methods for Fire Tests of Roof Coverings

E. California Code of Regulations (CCR), Title 24, California Building Code, Part 2, Chapter 15, Roofs and Roof Structures

1.04 SUBMITTALS

A. General: Refer to Section 01 33 00, Submittal Procedures, and Section 01 33 23, Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Shop Drawings and Product Data: Submit detailed Shop Drawings of copper roofing and related gutters and downspouts and installation details for review. Include manufacturer's product data for copper materials and manufactured items. Include manufacturer's specifications and details for a pre-engineered, factory-manufactured roofing system.

C. Samples:

1. Submit two sample squares, eight by 10 inches in size, of the copper pan sheet.

2. Submit sample standing-seam or batten-seam assembly, as indicated.

3. Submit samples of anchors and mechanical fasteners proposed for use for the type of substrate.

1.05 QUALITY ASSURANCE

A. Codes and Standards:

1. Comply with applicable requirements of the California Building Code, Part 2, Chapter 15, Roofs and Roof Structures.

2. Roofing shall meet Underwriters Laboratories' requirements for Class A copper roofing assembly in compliance with UL 790 and Class 90 wind uplift resistance in compliance with UL 580.

3. Shop or site fabricated sheet copper roofing shall be fabricated and installed in accordance with SMACNA Architectural Sheet Metal Manual, applicable Charts and Plates, and related specifications.

4. Pre-engineered and factory-manufactured copper roofing shall meet all requirements specified herein and shall be installed in accordance with the roofing manufacturer's installation instructions and written recommendations

5. Supervise waterproofing underlayment and flashings of roof penetrations in connection with copper roofing work.

B. Performance Requirements:

1. Copper sheet roofing work, gutters and downspouts, and related flashings shall be fabricated and installed by a licensed subcontractor, skilled and experienced in the type of work involved.

2. The Contractor and copper roofing materials manufacturer or supplier/installer shall design roof-edge details to prevent wind-uplift and damage to the roof from high winds and storms.

3. The Contractor and copper roofing material manufacturer or supplier/installer shall determine the probability of thermal and structural movement in the roofing system and shall provide for expansion and contraction in the roofing system as required to provide a serviceable roof without failures.

4. Provide copper roofing capable of withstanding thermal expansion and contraction movements for an ambient temperature change of 150 degrees Fahrenheit. without failure, including air and water leakage, and without noise from metal-to-metal contact in movement.

C. Copper Roofing Manufacturer's Field Services:

1. Where the roofing is to be a pre-engineered, factory-manufactured roofing system, the copper roofing materials' manufacturer shall inspect and approve all copper roofing installations and shall provide field services at no additional cost to the District.

2. The Contractor shall make all necessary arrangements with the manufacturer of the materials to be installed to provide on-site consultation and inspection services to ensure the proper installation of the copper roof and related flashings.

3. The manufacturer's representative shall be present at the time any phase of the work is performed. Copper roofing shall be applied only over surfaces previously approved by the manufacturer's representative.

1.06 ENVIRONMENTAL CONDITIONS AND PROTECTION

A. Provide protection of all station and building roof areas from moisture and rain. Provide water-repellent coverings as required. Leave no unroofed deck areas exposed to moisture and rain at any time, prior to installation of roofing.

1.07 GUARANTY

A. Copper roofing and related flashing installations shall be guaranteed against leakage, defective materials, and inferior work quality of the completed work. Any such defects or leakage occurring during the period of the guaranty shall be promptly and completely corrected, including all affected work, at no additional cost to the District.

B. In addition to the guaranty requirements specified in General Conditions Article GC4.9, provide a five-year roofing system guaranty or warranty, which shall state in essence that the Contractor and roofing installer shall, at their expense, make or cause to be made any repairs necessary to maintain the applied roof and related flashings in a watertight condition for a period of five years. The guaranty shall be effective from the date of Substantial Completion, and shall be signed by the roofing installer and countersigned by the Contractor, and shall be submitted to the Engineer as specified in Section 01 77 00, Closeout Procedures.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Roof Type: Copper roofing system shall be of the type indicated, shop or site fabricated or factory-manufactured standing-seam or batten-seam system suitable for the site installation conditions. All materials for shop or site fabricated roofing system shall conform with the SMACNA Architectural Sheet Metal Manual. Site fabricated batten-seam roofs shall employ pressure-treated preservative wood battens. Factory-manufactured batten-seam roofs may employ a snap-on structural batten system of indicated profile.

B. Sheet Copper: Standard cold-rolled copper sheet for building construction, conforming with ASTM B370, 16 oz., 20 oz., 24 oz., or 32 oz. per square foot as indicated or required. Where copper weights are not indicated, provide 16 oz. copper sheet. Provide sheets in as long lengths as practical to minimize joints. Gutters and downspouts shall be fabricated of 24 oz. copper. Cleats shall be minimum 20 oz. copper. Copper finish shall be as indicated.

C. Sheet Lead: Standard 0.062-inch thick lead sheet weighing 4 pounds per square foot, arsenical-antimonial and pig lead and tubing alloy meeting the requirements of ASTM B29. Use sheet lead and tubing for flashing of vent pipes and other penetrations of the roof.

D. Solder: Grade A meeting requirements of ASTM B32, composed of 50 percent pig lead and 50 percent block tin, warranted pure. Flux shall be an approved brand of soldering flux for copper or muriatic acid neutralized with zinc.

E. Wood Nailers and Battens: Wood nailers and battens shall be “Construction” or “No. 1” grade Douglas fir, pressure-treated with preservative, as specified in Section 06 10 00, Rough Carpentry, of size and dimensions indicated or required. Moisture content shall not exceed 19 percent.

1. Anchors and Fasteners: Wood nailers and battens shall be anchored to metal decking with self-drilling, self-tapping, tempered steel screws manufactured for the purpose of securing items to metal decking. Screws shall be specially treated to prevent corrosion. Wood nailers and battens shall be anchored to concrete substrates with expansion-type anchors as specified in Section 05 50 00, Metal Fabrications.

F. Roofing Felt: Asphalt-saturated glass felt, conforming with ASTM D2178 and weighing 30 pounds per 100 square feet.

G. Building Paper (Slip Sheet): Rosin-sized, unsaturated paper, weighing approximately six pounds per 100 square feet, or a water-repellent smooth building paper meeting requirements of FS UU-B-790.

H. Fasteners and Accessories: Furnish anchors and fasteners, washers, straps, and accessories required for a complete and finished installation. Fasteners and accessories shall conform with the following requirements:

1. Nails shall be hard copper, bronze, or brass. Where sheet metal is built in over roofing materials or other sheet metal, use nails or screws with 1-inch copper washers. Rivets shall be soft copper rivets. Screws shall be standard brass or bronze wood screws, as required. Sheet metal screws shall be self-drilling, self-tapping stainless steel or tempered non-corrodible steel of proper size and length to suit conditions.

2. Screw heads shall be furnished with neoprene washers.

3. Straps: Straps and miscellaneous fastenings, where required, shall be half-hard copper or half-hard 70-30 brass of size indicated or required. Where not indicated, provide straps of 1/8-inch thick by 1-inch wide size.

I. Sealant: Caulking or sealing compound shall be a silicone synthetic rubber elastomeric sealant that cures at normal temperature to a flexible firm rubber, tack free, in gun grade consistency. Sealant shall be specially designed for adhesion to the surfaces to which it will be applied, and shall meet or exceed the minimum requirements of FS TT-S-230 or FS TT-S-1543 or ASTM C920, as applicable.

J. Dielectric Isolating Material: Alkali-resistant bituminous paint or varnish.

2.02 FABRICATION

A. Form and fabricate standing-seam copper roofing, gutters, downspouts, and related flashings as indicated and in accordance with the approved Shop Drawings and the SMACNA Architectural Sheet Metal Manual. Properly reinforce sheet copper roofing as required for strength and appearance.

PART 3 – EXECUTION

3.01 EXAMINATION AND PREPARATION OF SUBSURFACES

A. Examination of Roof Deck Surfaces: Before starting the installation of any roofing work, examine all surfaces that the copper roofing and flashings are to be applied.

B. Cleaning and Preparation of Subsurfaces: Surfaces that copper roofing and flashings are to be applied shall be dry, clean of dirt and dust. Surfaces shall also be free from sharp protrusions and defective surfaces which will prevent a level and plane installation. Fill all joints, cracks, or depressions in subsurfaces with patch or underlayment material recommended by the manufacturer of the copper roofing system components.

C. Responsibility: Nothing specified herein shall be construed as relieving the Contractor of full responsibility for the waterproof quality of the finished installation. Surfaces that copper roofing and flashings are to be applied shall be in proper condition in every respect for installation of the copper roofing and flashings.

D. Protection: Protect structures to be roofed from moisture and rain until completion and acceptance of the roofing work

3.02 INSTALLATION

A. Installation Standards:

1. Install shop or site fabricated standing-seam or batten-seam sheet copper roofing and related gutters, downspouts, and flashings as indicated and in accordance with the approved Shop Drawings and the SMACNA Architectural Sheet Metal Manual.

2. Install factory-manufactured copper roofing and related gutters, downspouts, and flashings as indicated and in accordance with the approved Shop Drawings and the materials' manufacturer's installation instructions and written recommendations.

B. Flashings and Metal Trim: Provide flashings, counterflashings, ridge flashings, metal trim, and any other fabricated items and miscellaneous copper sheet metalwork indicated or required to provide a complete and watertight installation.

C. Gutters and Downspouts: Install gutters and downspouts as indicated and in accordance with the approved Shop Drawings and pertinent provisions of the SMACNA Architectural Sheet Metal Manual.

D. Work Quality:

1. Standing-seam and batten-seam sheet copper roofing shall be finished straight and true. Exposed work shall be free of dents and other defects. Corners shall be reinforced and seams made waterproof. Edges of sheet copper shall be hemmed.

2. Provide for expansion and contraction in sheet copper roofing and gutters by means of expansion joints or other appropriate methods of the SMACNA Architectural Sheet Metal Manual. Provide reinforcement as required.

3. Isolate and protect dissimilar metals from contact with each other by applying a heavy coating of the specified isolation material to contact surfaces.

4. Provide waterproof neoprene washers wherever required fasteners penetrate sheet metal. Exposed fasteners will not be permitted for any portion of this work.

5. Gutters shall have bottoms that slope continuously from expansion joints to downspout outlets as indicated.

E. Caulking and Sealing: Caulk or seal joints and laps of sheet copper as indicated or required for a waterproof installation. Beads of sealant that will be concealed in the finished work shall be continuous with no voids of materials. Interface and coordinate the caulking and sealing work of this Section with the work specified in Section 07 90 00, Joint Protection.

F. Flashings for Roof Penetrations:

1. Flashings of roof penetrations shall be four-pound lead. Flashings shall be accurately formed to conform with roofing contours and configurations and as required to assure a watertight installation. Flashings shall be built in as the roofing work progresses. Flash and burn lead against any penetrations through its surface.

2. Except as indicated otherwise, plumbing and mechanical vent flashings shall be offour-pound lead tubing. Flanges shall be minimum 18-inches square, and lead tubing shall be long enough to permit turning lead into the end of vent pipe.

3.03 FIELD QUALITY CONTROL

A. After completion of copper roofing and related work, a water test shall be performed for all roof areas, penetrations, and accessories by applying a sheet of water along the ridge or other high areas. The test shall be performed under the Engineer’s observation.

B. Should a leak appear, it shall be repaired, and the roof areas shall be retested as specified above until all work is watertight and acceptable.

END OF SECTION 07 61 00