SECTION 076220

Copper GUTTERS AND DOWNSPOUTS

THIS SECTION USES THE TERM "ARCHITECT." CHANGE THIS TERM AS NECESSARY TO MATCH THE ACTUAL TERM USED TO IDENTIFY DESIGN PROFESSIONAL AS DEFINED IN THE GENERAL AND SUPPLEMENTARY CONDITIONS.

1. - GENERAL
	1. SUMMARY

EDIT EXAMPLES BELOW BY DELETING ITEMS NOT REQUIRED, ADDING OTHERS, OR REVISING TEXT TO CLARIFY DESCRIPTIONS.

* + 1. Section Includes shop and field formed copper roofing accessories and trim, such as:
			1. Built-in Gutters.
			2. Hung gutters
			3. Downspouts (rain drainage).
			4. Through-wall scuppers and conductor heads.
			5. Miscellaneous accessories such as downspout strainers and gutter covers.

FOLLOWING ARE EXAMPLES OF SEVERAL POSSIBLE CROSS REFERENCES WHICH MAY BE NECESSARY TO CLARIFY WHAT WORK IS SPECIFIED WHERE.

* + 1. Related Requirements:
			1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this Section.
			2. Roofing accessories installed integral with roofing membrane are specified in roofing system sections as roofing work.
			3. Section 076110 – Copper Roofing.
			4. Section 076210 – Copper Roofing Specialties: Roof accessory units of pre-manufactured, set-on type.
			5. Section 079514 – Copper Expansion Joint Cover Assemblies: Building expansion joint covers.
			6. Sealants are generally specified in Division 07 Section, "Joint Sealants."
			7. Coordinate installation of built-in gutters with Plumbing drain lines specified in Division 22.
	1. COORDINATION
		1. Coordinate work of this section with interfacing and adjacent work for proper sequencing. Ensure weather resistance and durability of work and protection of materials and finishes.
	2. PERFORMANCE REQUIREMENTS

design professional is responsible for designING system, including anchorage, fastener size, and spacing.

* + 1. Installation Requirements: Fabricator is responsible for installing system, including anchorage to substrate and necessary modifications to meet specified and drawn requirements and maintain visual design concepts in accordance with Contract Documents and following installation methods as stipulated in the "Copper in Architecture” handbook published by the Copper Development Association (CDA).
			1. Drawings are diagrammatic and are intended to establish basic dimension of units, sight lines, and profiles of units.
			2. Make modifications only to meet field conditions and to ensure fitting of system components.
			3. Obtain Architect’s approval of modifications.
			4. Provide concealed fastening wherever possible.
			5. 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.
			6. Obtain Architect’s approval for connections to building elements at locations other than indicated in Drawings.
			7. Accommodate building structure deflections in system connections to structure.
		2. Performance Requirements:
			1. 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.
			2. Design system capable of withstanding building code requirements for negative wind pressure.
	1. SUBMITTALS
		1. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
		2. Product data for gutters, downspouts, and accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

DELETE BELOW IF NONE OF WORK SUFFICIENTLY COMPLEX TO JUSTIFY SHOP DRAWINGS; EDIT TO DELETE NONAPPLICABLE UNITS. POSSIBLY INSERT PRODUCT-HANDLING ARTICLE WHERE SUBSTANTIAL VOLUME OF HIGHLY FINISHED WORK IS REQUIRED.

* + 1. Shop drawings showing layout, profiles, expansion provisions, gutter slopes, methods of joining, and anchorage details, including downspout strainers, gutter covers, scuppers, and conductor head, and attachments to built-in plumbing drain lines, scuppers, and conductor head systems. Provide layouts at 1/4 inch (1:50) scale and details at 3 inch (1:4) scale.

RETAIN ABOVE AND INSERT SPECIFIC DATA SUBMITTALS AS DESIRED.

* + 1. Samples of the following flashing, sheet metal, and accessory items:
			1. 6-inch (150 mm) or 12-inch (300 mm) square samples of specified sheet materials to be exposed as finished surfaces.

DELETE ABOVE AND BELOW IF NO CONTROL REQUIRED ON SHEET MATERIALS. DELETE BELOW IF VISUAL CONTROL OF TRIM UNITS, GUTTERS, DOWNSPOUTS, EXPANSION JOINT UNITS, ETC. IS NOT DESIRED.

* + - 1. 6-inch (150 mm) or 12-inch (300 mm) long samples of fabricated products exposed as finished work. Provide complete with specified finish.
	1. CLOSEOUT SUBMITTALS
		1. Provide maintenance data in Operations and Maintenance manual for maintaining applied coatings on copper panels.

POSSIBLY INSERT QUALITY ASSURANCE ARTICLE HERE FOR LIMITATIONS ON FABRICATORS OR INSTALLERS OF COMPLEX SYSTEMS OF FLASHING, RAIN DRAINAGE, EXPANSION JOINTS, ETC.

* 1. QUALITY ASSURANCE
		1. Fabricator’s Qualifications: Company specializing in copper gutter and downspout work with three years experience in similar size and type of installations.
		2. Installer: A firm with 3 years of successful experience with installation of copper gutter and downspout work of type and scope equivalent to Work of this Section.
		3. 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 (CDA). Conform to dimensions and profiles shown.

DELETE ENTIRE MOCK-UP PROVISION BELOW UNLESS THE EXPENDITURE IS JUSTIFIED BY AN EXTENSIVE, UNUSUAL, OR CRUCIAL APPLICATION OF METAL ROOFING.

* + 1. Mock-Up: Before proceeding with final purchase of materials and fabrication of copper gutter and downspout work components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements. Install mock-up at location directed by Architect. Retain accepted mock-up as quality standard for acceptance of completed copper work. If accepted, mock-up may be incorporated as part of copper work.
			1. Mock-up area is indicated on Drawings.

DELETE EITHER ABOVE OR BELOW.

* + - 1. Provide mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and color.
	1. DELIVERY, STORAGE, AND HANDLING
		1. Packing, Shipping, Handling, and Unloading: Protect finish metal faces.
		2. Acceptance at Site: Examine each component and accessory as delivered and confirm that material and finish is undamaged. Do not accept or install damaged materials.
		3. Storage and Protection:
			1. Stack pre-formed material to prevent twisting, bending, and abrasions.
			2. Provide ventilation.
			3. Prevent contact with materials which may cause discoloration or staining.
	2. WARRANTY
		1. Warrant installed gutters, downspouts, and trim components to be free from defects in material and workmanship for period of 2 years.
		2. Include coverage against leakage and damages to finishes.
1. - PRODUCTS
	1. GUTTER AND DOWNSPOUT MATERIALS
		1. Copper: ASTM B370; minimum temper H00 (cold-rolled) except where temper 060 is required for forming;
			1. Hung Gutters and Downspouts: 16 oz. per sq. ft. (0.0216-inch thick) (0.55 mm) except as otherwise indicated.
			2. Built-in Gutters: 20 oz. per sq. ft. (0.0270-inch thick) (0.69 mm) unless otherwise required by guidance indicated in the Copper Development Association (CDA) "Copper in Architecture Handbook" and other recognized industry practices.
		2. Gutter Cover Guards: 20-gage bronze mesh or fabricated units, with selvaged edges and noncorrosive fasteners. Select materials for compatibility with gutters and downspouts.
		3. Bronze wire ball downspout strainer meeting the Copper Development Association Inc details.
	2. ACCESSORIES
		1. Solder: ASTM B32; Provide 50-50 tin/lead or lead free alternative of similar or greater strength solder.
		2. Flux: Muriatic acid neutralized with zinc or approved brand of soldering flux.
		3. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
		4. 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.
		5. 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.
		6. Metal Accessories: Provide cleats, straps, hangers, anchoring devices, and similar accessory units as required for installation of work, noncorrosive, size and gage required for performance.
		7. Rivets:
			1. Pop Rivets: 1/8-inch (3 mm) to 3/16-inch (4.5 mm) diameter, with solid brass mandrels.
			2. Provide solid copper rivet (tinner’s rivets) where structural integrity of seam is required.
	3. FABRICATION
		1. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of Copper Development Association (CDA) "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 substrates. Comply with material manufacturer 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.
			1. Fabricate to allow for adjustments in field for proper anchoring and joining.
			2. Form sections true to shape, accurate in size, square, free from distortion and defects.
			3. Cleats, Spacers, Straps, and Hanger Brackets: Fabricate of same material as gutters and downspouts, interlockable with sheet in accordance with CDA recommendations.
			4. Fabricate corners from one piece with minimum 18 inch (450 mm) long returns; solder corners for rigidity.
		2. Seams: Fabricate nonmoving seams with 1 inch (25 mm) lapped riveted and soldered seams. Tin edges to be seamed, lap seams, rivet seams, and solder.
		3. Expansion Provisions: Follow CDA Copper in Architecture Handbook guidance and provisions to accommodate expansion and contraction of gutter systems.

INSERT SPECIFIC LISTING (BELOW) OF SEPARATIONS KNOWN TO BE REQUIRED FOR WORK AS DETAILED. ATTEMPT SHOULD BE MADE IN DETAILING TO AVOID THIS NEED.

* + 1. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
		2. Solder
			1. Solder metal joints except those indicated or required to be movement type joints in accordance with the "Copper in Architecture” handbook published by the Copper Development Association (CDA).
			2. Tin edges of copper sheets and cleats at soldered joints.
			3. After soldering, remove flux. Wipe and wash solder joints clean with fresh water and baking soda to neutralize flux.
		3. Copper Thickness: Comply with CDA recommendations for copper size and shape.
		4. Gutters and Downspouts:
			1. Fabricate as indicated on Drawings and in accordance with the "Copper in Architecture” handbook published by the Copper Development Association (CDA).
			2. Fabricate front edge at least 1 inch (25 mm) lower than back edge.
			3. Transverse Seams in Gutter Liners: lapped, riveted and soldered for watertight gutter condition.
			4. Provide spacers, hanger brackets and straps, and fasteners as indicated and as recommended by CDA.
			5. Fabricate gutters and downspouts to sizes and profiles shown on Drawings.
		5. Through Wall Scupper: As indicated on Drawings and in accordance with the "Copper in Architecture” handbook published by the Copper Development Association (CDA). Fabricate scuppers of dimensions required with closure flange trim to exterior, 4 inches (100 mm) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof.
			1. Fasten gravel guard angles to base of scupper.
		6. Conductor Head: As indicated on Drawings and in accordance with CDA "Copper in Architecture” handbook. Coordinate with Section 076220 for connection to downspout.
	1. FINISHES
		1. Natural weathering mill finished copper. No applied finish.

\*\*\*\*\* OR \*\*\*\*\*

REVIEW PAINT SELECTION WITH COATINGS MANUFACTURER, REFER TO DIVISION 09.

* + 1. To retard natural weathering, apply a uniform coating of high grade paraffin oil (brown tones), or a clear lacquer coat (shiny).

clear coatings to retard weathering not recommended due to maintenance requirements.

* + 1. Clear Lacquer Coating
			1. Clear, Organic Coating: Clear, air‑drying, acrylic lacquer specially developed for coating copper alloy products, equivalent to Incralac by StanChem applied by air spray in 2 coats per manufacturer's directions, with interim drying, to total thickness of 1.0 mil.
1. - EXECUTION
	1. EXAMINATION
		1. General: Examine conditions and proceed with work when substrates are ready.
		2. Confirm that substrate system is even, smooth, sound, clean, dry, and free from defects.
	2. INSTALLATION
		1. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with the "Copper in Architecture” handbook published by the Copper Development Association (CDA). Anchor units of work securely in place by methods indicated, providing for thermal expansion of units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
			1. Install units plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction; except install gutters with required slope.
			2. Apply asphalt mastic on copper surfaces of units in contact with cementitious materials and dissimilar metals.
			3. Fit gutters to downspouts and flashings for watertight connections. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
			4. Miter, lap seam and close corner joints with solder. Seal seams and joints watertight with solder
			5. Install expansion joints at frequency recommended by the CDA "Copper in Architecture” handbook. Do not fasten moving seams such that movement is restricted.
			6. Coordinate with installation of roofing system and roof accessories.
		2. Gutters and, Downspouts:
			1. Flash and seal gutter to downspout.
			2. Slope gutters not less than 1/8 inch per foot (1:100).
			3. Provide expansion joints at 48’-0" (14 400 mm) maximum, not more than 24 feet (7200 mm) from corners.
			4. Hang gutter with copper straps spaced 30 inches (750 mm) centers maximum. Closer spacing may be required to handle system loads.
			5. Integrate gutter flashing conditions with requirements of adjacent roofing for watertight installation.
		3. Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters. Install "beehive"-type strainer-guard at downspouts in open gutters; removable for cleaning downspouts.
		4. Install counterflashing as indicated to prevent water from migrating behind gutter system.
		5. Parapet Scuppers:
			1. Install scuppers where indicated through parapet.
			2. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
			3. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
			4. Loosely lock front edge of scupper with conductor head.
			5. Seal or solder exterior wall scupper flanges into back of conductor head.
		6. Conductor Heads: Flash and seal conductor head to scupper.

INSERT OTHER SPECIFIC INSTALLATION REQUIREMENTS FOR OTHER SYSTEMS AND SHEET METAL ACCESSORY ITEMS SPECIFIED AS WORK OF THIS SECTION.

* 1. CLEANING
		1. Remove protective film (if any) from exposed surfaces of copper promptly upon installation. Strip with care to avoid damage to finishes. Do not allow protective film to fuse to copper.
		2. Clean exposed copper surfaces, removing substances that might cause abnormal discoloration of metal.
		3. 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.
		4. Clean exposed metal surfaces of substances that would interfere with uniform oxidation and weathering.
	2. PROTECTION
		1. Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION