SECTION 050387 - HISTORIC TREATMENT OF METAL SCULPTURE

Revise this Section by deleting and inserting text to meet Project-specific requirements.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Historic treatment of metal sculpture as follows:

Repairing [**copper-alloy**] [**and**] [**cast-iron**] sculpture.

Replacing damaged and missing components.

Refinishing [**copper-alloy**] [**and**] [**cast-iron**] sculpture.

Removing and dismantling sculpture for shop repair and replacement of components; reinstalling repaired work.

Painting steel uncovered during the Work.

* + - * 1. Related Requirements:

Retain subparagraph below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

* + - 1. ALLOWANCES

Retain products and Work in this Section that are covered by cash or quantity allowance. Do not include amounts. Insert descriptions of items in Part 2 or 3 to provide information affecting the cost of the Work that is not included under the allowance. Delete this article if all work is done by lump-sum price.

Quantity allowances require a Schedule of Quantity Allowances coordinated with a Unit-Price Schedule. See "Planning the Work" Article in the Evaluations for a discussion of the bidding method.

* + - * 1. Allowances for historic treatment of metal sculpture are specified in Section 012100 "Allowances."

If using quantity allowances, retain three subparagraphs below or include similar language in Section 012100 "Allowances" to clarify how work covered by quantity allowances is to be authorized.

Perform historic treatment of metal sculpture under quantity allowances and only as authorized. Authorized work includes**[ work required by Drawings and Specifications and]** work as directed in writing by Director’s Representative.

Retain first subparagraph below to suit Project.

Notify Director’s Representative **[weekly] <Insert time interval>** of extent of work performed that is attributable to quantity allowances.

Perform work that exceeds quantity allowances only as authorized by Change Orders.

Paragraphs below are examples only; revise to suit Project. Insert additional allowances according to retained types of work and allowances established. If there are multiple drawing designations for types of work, establish separate allowances for each drawing designation.

* + - * 1. Repairing **<Insert item description>** is part of **<Insert name of allowance>**.
				2. Refinishing **<Insert item description>** is part of **<Insert name of allowance>**.
			1. UNIT PRICES

Retain this article if Work specified in this Section is measured and paid for under the provisions of unit prices. Do not include amounts. Insert descriptions of items in Part 2 or 3 to provide information affecting the cost of the Work that is not included under the unit price.

Retain this article with "Allowances" Article for unit-price adjustments to quantity allowances.

Retain this article without "Allowances" Article if using a single Unit-Price Schedule with a column of estimated quantities on which bids are priced and evaluated.

* + - * 1. Work of this Section is affected by unit prices specified in Section 012200 "Cost Computations."

Unit prices apply to authorized work covered by **[quantity allowances] [estimated quantities]**.

Unit prices apply to authorized additions to and deletions from the Work as authorized by Change Orders.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

Pressure spray values below are not standardized but are typical for preparatory cleaning without abrasives; revise to suit Project. If abrasives are used, revise values because these pressures are too high.

* + - * 1. Low-Pressure Spray: **[100 to 400 psi ; 4 to 6 gpm ]**.
				2. Medium-Pressure Spray: **[400 to 800 psi ; 4 to 6 gpm ]**.
				3. High-Pressure Spray: **[800 to 1200 psi ; 4 to 6 gpm ]**.
			1. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at **[Project site] <Insert location>**.

If needed, insert list of conference participants not mentioned in Section 013591 "Historic Treatment Procedures."

Retain one or both subparagraphs below if additional requirements are necessary; include information about conference.

Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of metal sculpture.

Review methods and procedures related to historic treatment of metal sculpture including, but not limited to, the following:

Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.

Materials, material application, sequencing, tolerances, and required clearances.

Fire-protection plan.

Metal sculpture historic treatment program.

Coordination with building occupants.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.

Include recommendations for product application and use.

Include test data substantiating that products comply with requirements.

* + - * 1. Shop Drawings:

Include plans, elevations, and sections showing locations and extent of repair and replacement work, with enlarged details of replacement parts, profiles, methods of attachment, accessory items, and finishes.

Include field-verified dimensions and the following:

Full-size patterns with complete dimensions for new metal-sculpture components and their jointing, showing relation of existing to new components.

Identification of each new metal component and its location on the sculpture in annotated plans and elevations.

Provisions for weep holes.

Provisions for utilities or conduits if required.

Provisions for soldered, welded, and sealant joints if required.

Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs below for two-stage Samples.

* + - * 1. Samples for Initial Selection: For the following:

A range of each type of exposed finish prepared on metal of the same alloy matching existing metal.

Samples of sealant materials, miscellaneous materials, and components involving size, color, or finish selection.

* + - * 1. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:

Retain and revise subparagraphs below and insert others to suit Project.

Each type of new component to be used for replacing existing or missing components; 6 inches long in least dimension or whole item.

Retain "Patterns for Casting" Subparagraph and option in "Casting Samples" Subparagraph below for tight control of appearance and size (accommodating shrinkage) of cast components. If retaining "Patterns for Casting" Subparagraph and option in "Casting Samples" Subparagraph, consider limiting these requirements to specific, highly visible items. These requirements add to Project time and cost.

Patterns for Casting: Before casting components, submit the actual patterns from which molds will be made for casting. Package and ship to prevent loss or damage, or make patterns available for inspection by Director’s Representative at fabrication plant.

Casting Samples: For castings, provide one of each shape, color, and texture of component, suitable and ready for installation.**[ Make this submittal after acceptance of patterns for casting.]**

Each type of exposed connection between components. Show method of finishing components at connections.

Each type of exposed finish prepared on metal of the same alloy to be used for the Work of this Section; 6 inches long in least dimension.

Sealant materials.

Accessories: Each type of fastener, anchor, accessory, armature, and miscellaneous support in required finishes.

Retain "Delegated Design Submittal" Paragraph below if design services have been delegated to Contractor. Option is an example only.

* + - * 1. Delegated Design Submittal: For repaired sculpture**[, its structural armature,]** and attachment to supporting construction, including analysis data signed and sealed by the qualified professional engineer responsible for its preparation.

Consider "Qualification Data" and "Metal-Sculpture Historic Treatment Program" paragraphs below as they relate to Project goals and importance. To require responsive action by Architect after submittal review, move one or both paragraphs to "Action Submittals" Article.

* + - * 1. Qualification Data: For historic treatment specialist.

Retain "Evaluation Reports" Paragraph below if structural anchors are required.

Design Consultant to review code references and verify that the referenced sections/tables are current. Note that code references shall be based on the current version of the Uniform Code.

* + - * 1. Evaluation Reports: For post-installed structural anchors, from ICC-ES.
				2. Metal-Sculpture Historic Treatment Program: For historic metal sculpture.
			1. MAINTENANCE MATERIAL SUBMITTALS

Retain this article if required.

* + - * 1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and location on or in building.

Subparagraph below is an example only; revise to suit Project. If preferred, replace specific number with a percentage of required number of pieces of each element. Elaborate on descriptions if some component types require extra materials, but others do not.

Cast-Metal Replications: **[Five] <Insert number>** additional **[castings of each type] [castings of copper-alloy stars] <Insert requirement>**.

Retain "Molds for Castings" Paragraph below if future need for molds can be reasonably expected and Director’s Representative has space and takes responsibility for their storage and protection. Often, cast-metal manufacturer stores molds for long or indefinite periods. Patterns from which molds were made might be useful for display purposes, but they are less useful for fabrication than are molds. If a pattern or patterns are required, revise this article accordingly.

* + - * 1. Molds for Castings: On completion of manufacturing of cast components, deliver one unused mold of each shape and size of component to Project site. Deliver to a location and at a time determined by Director’s Representative, to become property of Director’s Representative.

Deliver molds carefully packed, protected from dirt, moisture, and breakage so as to arrive in usable, undamaged condition and enable long-term storage and possible future use.

* + - 1. QUALITY ASSURANCE

In "Historic Treatment Specialist Qualifications" Paragraph below, insert additional, specific requirements for demonstrating unique skills of firm and personnel to suit Project. See Section 013591 "Historic Treatment Procedures" for general qualifications of historic treatment specialist.

* + - * 1. Historic Treatment Specialist Qualifications: A qualified historic metal-sculpture repair and finishing specialist experienced in the types of metal, repairs, and finishing required. Experience installing and finishing new metal sculpture is insufficient experience for historic treatment work on metal sculpture.

Retain "Historic Cast-Iron Brazing-and-Welding Specialist" or "Historic Metal-Stitching Specialist" Subparagraph below, or both, for cast-iron sculpture, if required; revise to suit Project.

Historic Cast-Iron Brazing-and-Welding Specialist: A qualified brazing-and-welding-repair specialist experienced with these repairs on historic cast iron. Have the brazing-and-welding specialist work under direction of the historic treatment specialist.

Historic Metal-Stitching Specialist: A qualified metal-stitching-repair specialist experienced with metal stitching of historic cast iron. Have the metal-stitching specialist work under direction of the historic treatment specialist.

* + - * 1. Metal-Sculpture Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including each process or phase of repairing and finishing metal sculpture, related work, and the protection of surrounding materials and Project site.

If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

Retain required mockups in "Mockups" Paragraph below; insert others to suit Project. Test areas that were prepared or are required as part of a separate contract to evaluate and establish historic treatment materials and processes are not mockups. Generally, retain option because separate mockups may not adequately show blending of new work with existing work.

* + - * 1. Benchmarks : Prepare benchmarks of historic treatment repair and finishing processes**[ on existing surfaces]** to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation. Prepare benchmarks so they are inconspicuous.

Mockups in first five subparagraphs below are examples only.

Repairing Metal Defect: Repair a **[dent] [crack] [perforation] [hole] <Insert item>** by **[filling with sculpted metal-patching compound] <Insert requirement>** to align repaired components flush with and following contour of adjacent work.

Pinning Metal Component: Reattach a **[detached finger] [and] [missing star] <Insert item>** component of sculpture with new or repaired, salvaged component and align repair with adjacent work.

Stitching Metal Component: Repair a crack in cast iron by metal-stitching process.

Finishing Metal: **[Refinish] [Repair finish] [Wax finish]** a cleaned area **[approximately 2 sq. ft.] [as indicated on Drawings] <Insert dimension>** of **[bronze sculpture] <Insert item description>**.

Retain "Cast-Metal Components" Subparagraph below for custom castings or duplicate replacements. See the Evaluations for discussion on casting duplicates.

Cast-Metal Components: Submit patterns, models, or plaster castings made from existing metal-sculpture components for each replacement casting required.

Approval of benchmarks does not constitute approval of deviations from the Contract Documents contained in benchmarks unless DR specifically approves such deviations in writing.

* + - 1. FIELD CONDITIONS

Usually retain this article if Project includes exterior work; revise to suit Project.

* + - * 1. Weather Limitations: Proceed with historic treatment of metal sculpture only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.
1. PRODUCTS
	* + 1. PERFORMANCE REQUIREMENTS

Retain this article if Contractor is required to assume responsibility for design.

* + - * 1. Structural Performance: **[Bronze sculpture] <Insert item>**, including attachment to supporting construction, shall withstand the effects of gravity loads**[, design wind loads,]** and the following loads and stresses within limits and under conditions indicated:

Subparagraphs below are examples only; revise to suit Project and to comply with requirements of authorities having jurisdiction. Consult Project structural Director’s Representative for recommendations.

Uniform load of **[100 lbf/sq. ft. ] <Insert value>** applied in any direction.

Concentrated load of **[500 lbf ] <Insert value>** applied in any direction.

Uniform and concentrated loads need not be assumed to act concurrently.

* + - 1. PREPARATORY CLEANING MATERIALS

For sculpture having a mix of materials, such as painted and patinated metals, consider using cleaning materials and a single cleaning method selected for gentleness to all the materials and finishes on the sculpture. See Section 050371 "Historic Decorative Metal Cleaning" for additional cleaning materials and methods.

If local water is known to be unsuitable, consider informing Contractor of this in "Water" Paragraph below. Hard or softened water may be unsuitable even though potable.

* + - * 1. Water: Potable.

Retain "Hot Water" Paragraph below if heated water is required.

* + - * 1. Hot Water: Water heated to a temperature of 140 to 160 deg F .

Retain remaining paragraphs below to suit Project. Acidic cleaners are generally not used on exposed metals unless they will be painted.

Revise "Detergent Solution, Job Mixed" Paragraph below for specific laundry detergent requirements if known. Detergent products vary in composition.

* + - * 1. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

Revise "Nonacidic Liquid Chemical Cleaner" Paragraph below to suit Project. Always test cleaners on substrates to be cleaned.

* + - * 1. Nonacidic Liquid Chemical Cleaner: Manufacturer's standard mildly alkaline liquid cleaner, formulated for removing organic soiling from ordinary building materials including polished stone, brick, copper, brass, bronze, aluminum, stainless steel, plastics, wood, and glass.
				2. Abrasive Materials:

Abrasives can be used for paint removal as well as for cleaning surfaces, depending on the abrasive type and how it is used.

Materials in "Abrasive Pads" Subparagraph below can add fine scratches to bright-metal finishes. Use these pads only after pretesting the method of use.

Abrasive Pads: Non-scratch, of the following type(s):

Abrasive Pad with Sponge: Combination plastic abrasive pad, consisting of a sponge enclosed with a woven urethane, polypropylene, or other plastic mesh or fabric, without other abrasive components that can scratch metal.

Abrasive Pad of Plant Fibers: Agave, loofa, or another tough plant fiber, without other abrasive components that can scratch metal.

Material in "Medium Abrasives for Ferrous Metals" Subparagraph below can remove paint and plating from ferrous metals.

Medium Abrasives for Ferrous Metals: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.

Medium Abrasives for Copper Alloys: Extra-fine bronze wool or plastic abrasive pads.

Retain "Blasting Abrasive" Subparagraph below only if allowing abrasive blasting.

Blasting Abrasive: **[Pulverized walnut shells] [Powdered aluminum silicate] <Insert material>**.

* + - * 1. Wash Cloths: Lint-free, absorbent, durable cloth without abrasives that can scratch metal.

Product in "Rust Remover" Paragraph below is commonly used to remove iron oxide and leave behind a protective iron phosphate compound that resists further corrosion.

* + - * 1. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "naval jelly," for removing corrosion from iron and steel.
			1. METAL MATERIALS
				1. Provide metal materials made of the alloys, forms, and types that match existing metals and have the ability to receive finishes matching existing finishes unless otherwise indicated. Exposed-to-view surfaces exhibiting imperfections inconsistent with existing materials are unacceptable.

Retain one or more paragraphs below for replacement of cast-metal components or for reinforcing sculpture or repairing existing armatures within sculpture; revise to suit Project. Delete paragraphs below if allowing the historic treatment specialist to determine repair treatment materials.

* + - * 1. Copper Alloys, Bronze:

Plate, Sheet, Strip, and Bars: ASTM B36, Alloy UNS No. C28000 (muntz metal, 60 percent copper and 40 percent zinc).

Generally, retain "Composition Bronze Castings" or "Sand Castings" Subparagraph below if required. Verify availability and color matching of other copper-alloy forms with manufacturers.

Composition Bronze Castings: ASTM B62, Alloy UNS No. C83600 ("85-5-5-5" is the common trade name; 85 percent copper and 5 percent each of tin, lead, and zinc).

Sand Castings: ASTM B584, Alloy UNS No. C86500 (No. 1 manganese bronze; 58 percent copper, 39 percent zinc, 1 percent manganese, and small amounts of other metals).

Retain "Copper Alloys, Brass" Paragraph below for brassy-yellow color. Verify availability and color matching with manufacturers.

* + - * 1. Copper Alloys, Brass:

Plate, Sheet, Strip, and Bars: ASTM B36, Alloy UNS No. C26000 (cartridge brass, 70 percent copper and 30 percent zinc).

Sand Castings: ASTM B584, Alloy UNS No. C85200 (high-copper yellow brass, 72 percent copper, 24 percent zinc, and small amounts of other metals).

* + - * 1. Stainless Steel:

Plate, Sheet, and Strip: ASTM A240 or ASTM A666, **[Type 304] [Type 316]**.

Flat Bar: ASTM A666, **[Type 304] [Type 316]**.

Bars and Shapes: ASTM A276, **[Type 304] [Type 316]**.

* + - * 1. Steel:

Steel Plate, Shapes, and Bars: ASTM A36.

Steel Bars: Mild steel; ASTM A29, Grade 1010.

* + - * 1. Cast Iron: Standard designated below for each type of casting:

Gray-Iron Castings: ASTM A48, Class 30.

Malleable-Iron Castings: ASTM A47, grade as recommended in writing by fabricator for type of use indicated.

* + - 1. PINNING MATERIALS

Retain this article if Project requires reattachment of broken-off, non-load-bearing details such as fingers; revise to suit Project.

* + - * 1. Pins: Threaded, stainless steel rod, cut to length as required for each repair.
				2. Pinning Adhesive: Epoxy adhesive recommended in writing by adhesive manufacturer for bonding to type of cast metal being pinned.
			1. METAL-STITCHING MATERIALS
				1. Stitching Pins: Threaded steel screws sized for the thickness and condition of cast iron being repaired, with thread design that pulls the sides of a crack together, thereby both sealing the crack and adding strength to the repair.
				2. Locks: Multiple-dumbbell-shaped ties cut from steel sheet for installation in multiple thicknesses to add strength and distribute stresses in the cast iron as required for the thickness and condition of cast iron being repaired.
			2. FASTENERS
				1. Fasteners: Fasteners of the same basic metal as fastened metal unless otherwise indicated. Use metals that are noncorrosive and compatible with each metal joined.

Match existing fasteners in material and in type of fastener unless otherwise indicated.

Use concealed fasteners for interconnecting components and for attaching them to other work unless exposed fasteners are **[unavoidable] [or] [the existing fastening method]**.

Revise first subparagraph below if another screw type is required.

For exposed fasteners, use slotted machine screws of **[hex-head profile] [head profile flush with metal surface]** unless otherwise indicated**[ or another head is required to match the existing fastening method as determined by Director’s Representative ]**.

Finish heads of exposed fasteners to match finish of metal fastened unless otherwise indicated.

Retain "Post-Installed Structural Anchors" Paragraph below for items that include delegated design and where the design load of anchors is indicated. UNIFORM CODE-ES AC01 and UNIFORM CODE-ES AC193 are for expansion anchors in masonry and mechanical anchors in concrete, respectively; UNIFORM CODE-ES AC58 and UNIFORM CODE-ES AC308 are for adhesive anchors in masonry and concrete. Do not use expansion-type anchors where expansion can cause damage to the substrate material.

* + - * 1. Post-Installed Structural Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on **[UNIFORM CODE-ES AC01] [UNIFORM CODE-ES AC193] [UNIFORM CODE-ES AC58] [or] [UNIFORM CODE-ES AC308]** as appropriate for the substrate.

In "Uses" Subparagraph below, insert items that require anchorage to structure as required for safety or by Code.

Uses: Securing **[sculpture] <Insert item>** to supporting construction.

Retain "Type" Subparagraph below to restrict type of anchor if required.

Type: **[Torque-controlled, expansion anchor] [torque-controlled, adhesive anchor] [or] [adhesive anchor]**.

Material in "Material for Interior Locations" Subparagraph below protects against corrosion in an indoor atmosphere.

Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

Alloy Group 1 (A1) refers to Type 304 and similar alloys, and Alloy Group 2 (A4) refers to Type 316 and similar alloys.

Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy **[Group 1 (A1)] [Group 2 (A4)]** stainless steel bolts, ASTM F593, and nuts, ASTM F594.

Retain "Post-Installed Nonstructural Anchors" Paragraph below for items that do not include delegated design and where the design load of anchors is not indicated. UNIFORM CODE-ES AC01 and UNIFORM CODE-ES AC193 are for expansion anchors in masonry and mechanical anchors in concrete, respectively; UNIFORM CODE-ES AC58 and UNIFORM CODE-ES AC308 are for adhesive anchors in masonry and concrete. Do not use expansion-type anchors where expansion can cause damage to the substrate material.

* + - * 1. Post-Installed Nonstructural Anchors: Fastener systems with bolt heads of same basic metal as fastened metal, if visible, unless otherwise indicated; with an evaluation report acceptable to authorities having jurisdiction, based on **[UNIFORM CODE-ES AC01] [UNIFORM CODE-ES AC193] [UNIFORM CODE-ES AC58] [or] [UNIFORM CODE-ES AC308]** as appropriate for the substrate.

Retain "Type" Subparagraph below to restrict type of anchor if required.

Type: **[Expansion anchor] [adhesive anchor] [types matching existing] [or] [types indicated on Drawings]**

Material in "Material for Interior Locations" Subparagraph below protects against corrosion in an indoor atmosphere.

Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

Alloy Group 1 (A1) refers to Type 304 and similar alloys, and Alloy Group 2 (A4) refers to Type 316 and similar alloys.

Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy **[Group 1 (A1)] [Group 2 (A4)]** stainless steel bolts, ASTM F593, and nuts, ASTM F594.

* + - 1. PROTECTIVE COATING MATERIALS

Retain "Wax Coating" or "Lacquer Coating" Paragraph below, or both, to suit Project; if retaining more than one coating, indicate location of each on Drawings or by inserts. First paragraph specifies a wax coating commonly used for application to exterior copper-alloy statuary after cleaning, repairing, and patinizing; it generally requires reapplying annually or biennially. Waxes can also be applied to other metals but are generally not applied over painted coatings. Generally, retain last option in first paragraph if using hot-wax method of application. Verify with Director’s Representative that wax coating is appropriate for Director’s Representative's continuing maintenance capability.

BWC Company products are carnauba-based waxes with solvents. Its "Boston Polish Wax" is amber, its "Bowling Alley Wax" is clear, and its "New England Brown Wax" is dark brown.

Fisher Scientific products are yellow carnauba wax flakes or powder without solvent.

Real Milk Paint Co. products are carnauba wax with or without solvents. Its "Carnauba Wax Flakes" vary from yellow to light brown and are without solvent, and its "Carnauba Wax Paste" is with solvent.

Talas products are waxes without solvents. Its "Be Sq #175 Microcrystalline Wax" is amber microcrystalline wax, its "Carnauba Wax" is pure carnauba wax flakes (No. 1, yellow), and its "Cosmolloid 80 H" and "Victory White Microcrystalline Wax" are clear microcrystalline waxes.

* + - * 1. Wax Coating: Inert, high-melting-point wax or wax blend, consisting primarily of **[carnauba] [or] [microcrystalline petroleum]** wax**[ and no solvents]**.

Color: **[Clear] [Amber] [Dark brown]**.

"Lacquer Coating" Paragraph below specifies a resin coating commonly used for application to exterior bronze statuary after cleaning, repairing, and patinizing; it generally requires removing and reapplying every five years or less. It can be applied to other metals but is generally not applied over painted coatings. Verify, with Director’s Representative, that this coating is appropriate for Director’s Representative's continuing maintenance capability.

* + - * 1. Lacquer Coating: Clear, organic, waterborne, air-drying, acrylic lacquer called "Incralac"; specially developed for coating copper-alloy products; consisting of a solution of acrylic resin, methyl methacrylate copolymer, levelling agent, and corrosion inhibitor benzotriazole.

Product in "Copper-Alloy Corrosion Inhibitor" Paragraph below is commonly used to stabilize residual cuprous chloride and prevent further corrosion. Revise water to ethanol if required; ethanol penetrates cracks and crevices better than water.

* + - * 1. Copper-Alloy Corrosion Inhibitor: Solution of **[1] [to] [3] <Insert number>** percent benzotriazole in water.
			1. ACCESSORIES

Retain "Metal-Patching Compound" Paragraph below for filling nonstructural defects in existing metal surfaces; revise to suit Project. Retain option if patch repairs are acceptable in surfaces that will not be painted.

* + - * 1. Metal-Patching Compound: Two-part, epoxy- or polyester-resin, metal-patching compound**[ of color matching finish of base metal]**; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated because of corrosion or deformation. Filler shall be capable of filling deep holes and spreading to feather edge.

Retain "Brazing Rods" Paragraph below if components will be brazed.

* + - * 1. Brazing Rods: Type and alloy as recommended in writing by brazing-rod manufacturer and as required for color match, strength, and compatibility in fabricated items.

Retain "Welding Electrodes and Filler Metal" Paragraph below if components will be welded or filled using welding. Consider deleting the phrase "color match" if all components will be painted or gilded.

* + - * 1. Welding Electrodes and Filler Metal: Select according to AWS specifications for metal alloy welded; use metal type and alloy as required for color match, strength, and compatibility in fabricated items.

Retain "Nonshrink, Nonmetallic Grout" Paragraph below to suit Project.

* + - * 1. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended in writing by manufacturer for interior and exterior applications.

Retain "Sealant Materials" Paragraph below if sealants are required.

* + - * 1. Sealant Materials:

Coordinate type(s) of joint sealant required in first subparagraph below with applicable subparagraphs used in Section 079200 "Joint Sealants" in which various sealant types are specified. Revise sealant type or insert others if required. If more than one type of sealant is required, revise subparagraph and indicate location of each on Drawings or by inserts.

Provide manufacturer's standard, elastomeric **[nonstaining, single-component, nonsag silicone] [single-component, nonsag urethane] <Insert type>** sealant complying with applicable requirements in Section 079200 "Joint Sealants."

Colors: Provide colors of exposed sealants to match colors of metals in which sealant is placed unless otherwise indicated.

Retain "Antirust Coating" Paragraph below if retaining "Painting Steel Uncovered during the Work" Article. MPI #23 is a performance-based alkyd coating that may or may not contain zinc. SSPC-Paint 20 and SSPC-Paint 29 are zinc-rich coatings.

* + - * 1. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer according to **[MPI #23 (surface tolerant, anticorrosive metal primer)] [or] [SSPC-Paint 20 or SSPC-Paint 29] <Insert requirement>**.

Coordinate surface preparation standard in "Surface Preparation" Subparagraph below with surface preparation standard in "Painting Steel Uncovered during the Work" Article. If known, consider inserting manufacturer's name and product name.

Surface Preparation: Use coating requiring no better than **[SSPC-SP 2, "Hand Tool Cleaning,"] [SSPC-SP 3, "Power Tool Cleaning,"] [or] [SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning,"] <Insert surface preparation standard>** surface preparation according to manufacturer's literature or certified statement.

In "VOC Limit" Subparagraph below, option is the EPA limit for rust-preventive architectural coatings.

VOC Limit: Use coating with a VOC content of **[400 g/L ] <Insert VOC limit>** or less

* + - * 1. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
				2. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of acidic and alkaline cleaners.
				3. Masking Tape: Nonstaining, nonabsorbent material; compatible with chemical solutions being used and substrate surfaces, and that will easily come off entirely, including adhesive.
				4. Other Products: Select materials and methods of use based on the following, subject to approval of a benchmark:

Previous effectiveness in performing the work.

Little possibility of damaging exposed surfaces.

Consistency of each application.

Uniformity of the resulting overall appearance.

Do not use products or tools that could do the following:

Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in the Contract.

Leave an unintended residue on surfaces.

* + - 1. METAL FABRICATION

Revise paragraphs below to suit Project.

* + - * 1. Custom fabricate replacement components in sizes and profiles to match existing metal sculpture unless otherwise indicated, with accurate curves, lines, and angles. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
				2. Provide uniform, neat seams with minimum exposure of welds, brazing, solder, and sealant.
				3. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for fasteners. Use concealed fasteners where possible; use exposed fasteners to match existing work.
				4. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.

Use materials and methods that match color of base metal, minimize distortion, and develop maximum strength and corrosion resistance.

Remove flux immediately.

At exposed connections, match contours of adjoining surfaces, and finish exposed surfaces smooth and blended so no roughness shows after finishing.

* + - * 1. Castings: Fabricate castings free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.

Retain "Date Identification" Paragraph below for historic treatment projects where differentiation of new materials from original materials is required.

* + - * 1. Date Identification: Permanently imprint on a concealed, interior surface of the metal body of each new component, in easily read characters, "MADE **<Insert year>**." Manufacturer's name may also be labeled. Do not deform components with this identification process.**[ For cast metals, add the identification to the mold pattern before casting.][ For malleable metals, stamp identification with an imprinting tool.]**
			1. FINISHES, GENERAL
				1. Protect statuary and its finishes from damage by applying a strippable, temporary protective covering in addition to padding and crating before shipping or transporting statuary between work area and installation location.
				2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
			2. COPPER-ALLOY FINISHES

Retain finishes in this article for bare copper-alloy sculpture or components to suit Project. Consult a preservation specialist before retaining or inserting other finishes, because these standardized finishes may be inappropriate for unique historic sculpture. If retaining more than one finish, indicate location of each on Drawings or by inserts.

* + - * 1. Finish designations for copper alloys comply with the system defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)."

"Buffed Finish," "Buffed Finish, Lacquered," "Satin Hand-Rubbed Finish," and "Satin Hand-Rubbed Finish, Lacquered" paragraphs below specify natural-color finishes. Consult a preservation specialist on the suitability of these finishes for exterior exposure, if required, and requirements for clear protective coatings. Retain first paragraph for finish that weathers and changes color naturally over time unless clear coated with wax, oil, or lacquer coating. First option in first paragraph is mirrorlike; second option is less bright. Insert wax or oil coating if required. NAAMM's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" does not have a number for waxes and oils.

* + - * 1. Buffed Finish: **[M21 (buffed, smooth specular mechanical finish)] [M22 (buffed, specular mechanical finish)] <Insert description>**.
				2. Buffed Finish, Lacquered: **[M22 (buffed, specular mechanical finish; specified clear lacquer coating)] <Insert description>**.

Retain "Satin Hand-Rubbed Finish" Paragraph below for finish that weathers and changes color naturally over time unless clear coated with wax, oil, or lacquer coating. Insert wax or oil coating if required. NAAMM's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" does not have a number for waxes and oils.

* + - * 1. Satin Hand-Rubbed Finish: **[M32-M34 (directionally textured, medium satin and hand-rubbed mechanical finishes)] <Insert description>**.
				2. Satin Hand-Rubbed Finish, Lacquered: **[M32-M34-06x (directionally textured, medium satin and hand-rubbed mechanical finishes; specified clear lacquer coating)] <Insert description>**.

Remaining paragraphs below specify patinated finishes. Consult a preservation specialist on the suitability of patinas for exterior exposure, if required, and requirements for clear protective coatings. Chemical patinization is difficult to control to achieve a precise color; the skill of the Applicator is important. Patinated finishes are generally used in nontraffic locations where there is little or no maintenance; clear lacquer coating, hot wax, or oil can be applied to improve wear resistance. Hot wax and oil tend to saturate and darken the surface more than a clear lacquer coating.

* + - * 1. Satin Finish with Statuary Conversion Coating: **[M32-C55 (directionally textured, medium satin; sulfide conversion coating)] <Insert description>**.

First and second options in "Color" Subparagraph below are preferred methods of specifying to accommodate variations in color.

Color: **[Match design reference sample] [Match existing] [Match Sample] <Insert color>**.

Coarseness of finish in "Brushed Finish with Patina Conversion Coating" Paragraph below is controlled by diameter and speed of wheel and pressure exerted.

* + - * 1. Brushed Finish with Patina Conversion Coating: M35-C12-C52 (directionally textured, rotary brushed and buff polished, nonetched cleaned; ammonium sulfate conversion coating).

First and second options in "Texture and Color" Subparagraph below are preferred methods of specifying to accommodate variations in texture and color.

Texture and Color: **[Match design reference sample] [Match existing] [Match Sample] <Insert description>**.

"Bright-Relieved Statuary Conversion Coating, Lacquered" Paragraph below is an example of a more complex finish requiring the highest skill level. Revise paragraph if deeper color such as blackening is required.

* + - * 1. Bright-Relieved Statuary Conversion Coating, Lacquered: M12-C55-M2x-06x (matte finish as cast; sulfide conversion coating; buffed to brighten high spots; specified clear lacquer coating).

First and second options in "Color and Buffing" Subparagraph below are preferred methods of specifying to accommodate variations in color and extent of bright relief (buffing).

Color and Buffing: **[Match design reference sample] [Match existing] [Match Sample] <Insert description>**.

Retain paragraph below for proprietary patina finish not listed above. Patina finishes are available from manufacturers of new decorative metals.

* + - * 1. **<Insert name>** Patina Finish: **<Insert description>**.
			1. FERROUS METAL FINISHES

Retain this article for finishes applied to bare cast-iron sculpture or components; insert other finishes if required. If retaining more than one finish, indicate location of each on Drawings or by inserts. Repaired cast iron generally requires immediate priming to prevent corrosion before final painting.

Retain "Repair Primer" or "Finish Primer" Paragraph below, or both. Retain option in "Repair Primer" Paragraph to require primer to be compatible with remaining existing paint, if any, and with applied finish paint.

* + - * 1. Repair Primer: Manufacturer's standard, rust-inhibiting, fast-curing, lead- and chromate-free universal primer, compatible with**[ firmly adhered existing paint and]** applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
				2. Finish Primer: Primer complying with applicable requirements in **[Section 090391 "Historic Treatment of Plain Painting"] <Insert Section number and title>** for finish painting of primed historic metal.

Retain "Patina Finish" Paragraph below for patina finish on bare cast iron. Verify, with sculpture specialists, the suitability of patinas for exterior exposure, if required, and requirements for clear protective coatings.

* + - * 1. Patina Finish: **<Insert description>**.
1. EXECUTION
	* + 1. HISTORIC TREATMENT SPECIALIST

Retain this article if list of preapproved firms is used as quality-control procedure.

If retaining second option in "Historic Treatment Specialist Firms" Paragraph below, include procedure for approving other firms in Document 002213 "Supplementary Instructions to Bidders.

* + - * 1. Historic Treatment Specialist Firms: Subject to compliance with requirements **[provide historic treatment of metal sculpture by one of the following] [firms that may provide historic treatment of metal sculpture include, but are not limited to, the following]**:

**<Insert, in separate subparagraphs, names of historic treatment specialist firms>**.

* + - 1. PROTECTION
				1. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

Cover adjacent surfaces with materials that are proved to resist chemical solutions being used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

Do not apply chemical solutions during winds of enough force to spread them to unprotected surfaces.

Neutralize alkaline and acid wastes before disposal.

Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

* + - 1. HISTORIC METAL-SCULPTURE TREATMENT, GENERAL

Revise this article to suit Project. See Section 013591 "Historic Treatment Procedures" for general historic treatment procedures.

Retain "Appearance Standard" Paragraph below to control overall appearance from a distance.

* + - * 1. Appearance Standard: Treated surfaces are to have a uniform appearance as viewed from **[20 feet ] [50 feet ] <Insert distance>** away by Director’s Representative .
				2. Execution of the Work: In treating historic items, disturb remaining existing work as minimally as possible and as follows:

Stabilize metal sculpture to reestablish structural integrity and weather resistance while maintaining the existing form of each item.

Remove dirt, deteriorated coatings, and corrosion.

Sequence work to minimize time before protective coatings are applied.

Repair items where stabilization is insufficient to stop progress of deterioration.

Repair and finish items in place unless otherwise indicated and retain as much original material as possible.

Replace or reproduce historic finishes or components where indicated or scheduled.

Make treatment of materials reversible whenever possible.

* + - * 1. Mechanical Coating Removal: Use only the gentlest mechanical methods, such as scraping and wire brushing, that do not abrade metal substrate. Do not use abrasive methods, such as sanding, or power tools except as indicated as part of the historic treatment program and approved by Director’s Representative.
				2. Repairing Metal Sculpture: Match existing materials and features, retaining as much original material as possible to complete the repair.

Unless otherwise indicated, repair metal sculpture by straightening, patching, piecing-in, splicing, or otherwise reinforcing metals with new metal matching existing metal, form, and texture.

Where indicated, repair metal sculpture by limited replacement to the extent indicated, matching existing material.

* + - * 1. Replacing Metal-Sculpture Components: Where indicated, duplicate and replace items with new metal matching existing metal.

Replace heavily deteriorated or missing parts or features of metal sculpture with matching materials, using surviving prototypes to create patterns or dies for duplicate replacements.

Do not use substitute materials unless otherwise indicated.

Retain option in "Refinishing Metal Sculpture" and "Repairing Finish of Metal Sculpture" paragraphs below if required; revise to suit Project.

* + - * 1. Refinishing Metal Sculpture: Remove existing finish on sculpture unless otherwise indicated**[, including integral polished or patinated finish,] and [reapply it] [apply new, specified finish]**.
				2. Repairing Finish of Metal Sculpture: Restore areas of deteriorated or missing finish on sculpture and blend restored finish with existing, adjacent finish**[, including integral polished or patinated finish]**.
			1. PREPARATORY CLEANING

Retain cleaning methods in this article for cleaning sculpture before other treatment work; revise to suit Project; consult a preservation specialist before retaining or inserting other methods. See the Evaluations in Section 050371 "Historic Decorative Metal Cleaning." Spray methods are typically inappropriate for interior areas. High-pressure spray may be too harsh if applied to sculpture attached to masonry with soft joints.

* + - * 1. Perform preparatory cleaning before performing repair work. Use only those methods indicated for each type of metal sculpture and its location.

Brushes: If using wire brushes, use brushes of same base metal composition as metal being treated. Use brushes that are resistant to chemicals being used.

Retain "Spray Equipment" Subparagraph below only if allowing spray methods.

Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.

Equip units with pressure gages.

Retain first subparagraph below unless spray application of chemical cleaners is unacceptable. Wind drift of chemical cleaners is often a problem with spray application.

For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone-shaped spray.

Fan-shaped spray angle in first subparagraph below is considered efficient for low and medium pressure and less harmful than sprays with narrower angles. Never use a fan spray with an angle of less than 15 degrees.

For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.

Retain first subparagraph below if high-pressure spray is permitted.

For high-pressure water-spray application, use fan-shaped spray that disperses water at an angle of at least 40 degrees.

Retain first subparagraph below if heated water is required. Revise temperature range to suit Project.

For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

Uniformity: Perform each cleaning method in a manner that results in uniform coverage of all surfaces, including corners, contours, and interstices, and that produces an even effect without streaks or damaging surfaces.

Protection: After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

Generally, retain last option in "Water Cleaning" Paragraph below for sculpture with desirable patina. This method can remove patina if used aggressively.

* + - * 1. Water Cleaning: Clean with [cold] [hot] water applied with **[sponges or wash cloths] [low-pressure spray] [medium-pressure spray] [high-pressure spray]**. Supplement with **[natural-fiber] [or] [plastic]** bristle brush**[ and abrasive pads].** Use small brushes to remove soil from joints and crevices.**[ Leave uniform patina intact.]**
				2. Detergent Cleaning:

Wet surface with **[cold] [hot]** water applied with **[sponges or wash cloths] [low-pressure spray]**.

Generally, retain last option in first subparagraph below for sculpture with desirable patina. Scrubbing can remove patina if used aggressively.

Scrub surface with detergent solution and **[natural-fiber] [or] [plastic]** bristle brush**[ and abrasive pads]** until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.**[ Leave uniform patina intact.]**

Retain one of first two options and one of last four options in subparagraph below.

Rinse with **[cold] [hot]** water applied with **[sponges or wash cloths] [low-pressure spray] [medium-pressure spray] [high-pressure spray]** to remove detergent solution and soil.

* + - * 1. Nonacidic Liquid Chemical Cleaning: Apply chemical cleaner to surfaces according to chemical-cleaner manufacturer's written instructions.

Alkaline cleaners work better with hot water.

Wet surface with **[cold] [hot]** water applied by low-pressure spray.

Apply cleaner to surface**[ in two applications]** by brush**[ or low-pressure spray]**.

Retain one option in first subparagraph below; revise to suit Project. Third option is an example only.

Let cleaner remain on surface for period **[recommended in writing by chemical-cleaner manufacturer] [established by mockup] [of two to three minutes] <Insert requirement>**.

Retain one of first two options and one of last three options in "Copper Alloys" Subparagraph below.

Copper Alloys: Rinse with **[cold] [hot]** water applied by **[low] [medium] [high]**-pressure spray to remove chemicals and soil.

Ferrous Metals: Do not rinse ferrous metals with water; neutralize chemical cleaner on ferrous metals as recommended in writing by manufacturer. Dry immediately with clean soft cloths. Follow direction of grain in metal.

Retain "Cleaning by Abrasive Blasting" Paragraph below only if allowing abrasive blasting. Retain last option below for metals with desirable patina. Abrasive blasting can remove patina if used aggressively or with hard abrasives.

* + - * 1. Cleaning by Abrasive Blasting: Clean surfaces to remove dirt by dry blasting with specified blasting abrasive at pressure and distance from surface indicated below. **[Rinse with cold water, low-pressure spray to remove residue] [Do not rinse ferrous metals with water; wipe with soft brushes and damp cloths to remove residue] [Leave uniform patina intact.] <Insert requirement>**.

Pressure and Distance from Surface:

Retain one of two subparagraphs below.

Maximum pressure of **[60 psi ] [100 psi ] [200 psi ] <Insert value>** with specified blasting abrasive propelled from a distance of **[6 to 12 inches ] [12 to 18 inches] <Insert dimension>** from surface.

As established by benchmark.

Method in "Chemical Rust Removal" Paragraph below is commonly used to convert reddish-brown iron oxide (rust) into a water-soluble, black, iron phosphate compound that is easier to remove and resists further corrosion.

* + - * 1. Chemical Rust Removal:

Remove loose rust scale with approved, medium abrasives for ferrous metals.

Apply rust remover with brushes or as recommended in writing by manufacturer.

Allow rust remover to remain on surface for period recommended in writing by manufacturer or as determined by testing. Do not allow extended dwell time.

Wipe off residue with mineral spirits and either steel wool or soft rags, or clean with method recommended in writing by manufacturer to remove residue.

Dry immediately with clean, soft cloths. Follow direction of grain in metal.

Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

Method in "Mechanical Rust Removal" Paragraph below is labor-intensive but avoids use of harsh chemicals.

* + - * 1. Mechanical Rust Removal:

Remove rust with approved, medium abrasives for ferrous metals.

Wipe off residue with mineral spirits and either steel wool or soft rags.

Dry immediately with clean, soft cloths. Follow direction of grain in metal.

Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

* + - 1. DISMANTLING, REPAIR, AND INSTALLATION
				1. Repair sculpture in place so far as practicable unless otherwise indicated. Where necessary, dismantle sculpture and components from their substrate and repair and reinstall them according to approved historic treatment program.

Indicate on Drawings or in the Historic Metal-Sculpture Schedule which items are to be dismantled and reinstalled. Dismantled and salvaged items may be available for creating duplicates. Verify condition and availability of existing materials for repair and reinstallation or to create molds or patterns.

* + - * 1. Installation:

Locate and place sculpture level and plumb and in alignment with adjacent construction.

Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

Retain "Touch up" Paragraph below for prefinished components and bare-metal finishes; revise to suit Project.

Touch up: At completion of installation, touch up and restore damaged or defaced finish surfaces and fastener heads.

Retain "Sealant" Paragraph below if joint sealants are required; revise to suit Project.

* + - * 1. Sealant: Clean and prepare joint surfaces and apply and cure sealant according to Section 079200 "Joint Sealants."

After metal reinstallation, keep joints to receive sealant dry and free of debris.

Option in first subparagraph below establishes priming as default requirement rather than relying on Contractor's judgment.

**[Prime joint surfaces unless sealant manufacturer recommends against priming.]**Do not allow primer to spill or migrate onto adjoining surfaces.

Fill sealant-type joints with specified joint sealant as recommended in writing by sealant manufacturer and the following:

Install sealant using only proved installation methods that ensure that sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding metal unless otherwise indicated.

Do not allow sealant to overflow or spill onto adjoining surfaces or to migrate into the voids of adjoining surfaces, particularly rough or sculptural textures. Promptly remove excess and spillage of sealant as the work progresses. Clean adjoining surfaces by means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved benchmark.

* + - 1. FILLING DEFECTS IN SURFACES

Retain this article for filling nonstructural defects in existing metal surfaces; revise to suit Project. Epoxy repairs in copper-alloy surfaces will often become apparent as the repair ages; small pin-hole defects in copper alloys are sometimes filled by applying only a protective wax coating specified in the "Protective Coating" Article. Repairs in cast iron are typically painted over with the entire sculpture.

* + - * 1. Repair non-load-bearing defects in existing **[copper-alloy] [and] [cast-iron]** surfaces, including dents and gouges more than **[1/16 inch] [1/8 inch] <Insert dimension>** deep or **[1/2 inch] [1 inch] <Insert dimension>** across and all holes and tears by filling with metal-patching compound. Remove burrs.**[ Prime cast-iron immediately after repair to prevent flash rusting.]**

Apply metal-patching compound to fill depressions, nicks, cuts, and other voids created by rusted, removed, or missing metal.

Mix only as much patching compound as can be applied according to manufacturer's written instructions.

Apply patching compound in layers of maximum 1/8-inch thickness and as recommended in writing by manufacturer until the void is completely filled.

Finish patch surface smooth and shaped flush with adjacent contours, without voids in patch material.

Clean spilled compound from adjacent materials immediately.

* + - 1. PINNING

Retain this article if Project requires reattachment of broken-off, non-load-bearing details such as a finger; revise to suit Project.

* + - * 1. Use the metal piece that has broken off or a custom, cast replica of a similar item. Verify that the repair piece is a correct match for the remaining existing work and is of a size that can be pinned.
				2. Grind mating surfaces of base metal and repair piece along the repair seam to produce an accurate fit and alignment with the base assembly. Grind mating surfaces to produce joint size no larger than **[1/32 inch ] <Insert dimension>**.

Retain "Exposed Pinning" or "Concealed Pinning" Paragraph below; if retaining both, indicate locations on Drawings or by inserts. Method in second paragraph might be required for repairs close to view, but it is more difficult. Revise pin diameter, length, or spacing if required. Consider deleting last two options in either paragraph and indicating pin layout on Drawings.

* + - * 1. Exposed Pinning: Before applying adhesive, prepare for mechanical anchorage consisting of 1/8-inch- diameter, threaded stainless steel pins set into 3/16-inch- diameter holes drilled at through face of repair piece and into base metal.**[ Insert pins at least 1 inch into base metal and 1 inch into repair piece with end countersunk at least 1/4 inch from exposed face of repair piece.] [For large pieces, center and space pins 3 inches apart and at least 1/4 inch from any edge.]**
				2. Concealed Pinning: Before applying adhesive, prepare for concealed mechanical anchorage consisting of 1/8-inch-diameter, threaded stainless steel pins set into aligned, 3/16-inch- diameter holes drilled into base metal and into, but not through, the repair piece.**[ Insert pins at least 1 inch into base metal and 1 inch into repair piece.] [For large pieces, center and space pins 3 inches apart and at least 1/4 inch from any edge.]**
				3. Apply pinning adhesive according to adhesive manufacturer's written instructions. Fill holes and coat bonding surfaces of base metal and repair piece.
				4. Apply repair piece while adhesive is fresh and hold securely in place until adhesive has cured. Use temporary shims, clamps, wedges, or other devices as necessary to keep repair piece and base metal aligned.

Retain option in paragraph below if retaining "Exposed Pinning" Paragraph.

* + - * 1. Clean adhesive residue from exposed surfaces**[ and fill exposed drill holes]** as specified in "Filling Defects in Surfaces" Article.
			1. METAL STITCHING

Retain this article for structural repairs to cast iron without using heat processes.

* + - * 1. Install metal-stitching materials according to written instructions of metal-stitching-system manufacturer for the thickness and condition of cast iron being repaired.
				2. Drill, tap, and install metal-stitching pins along entire length of crack being repaired, overlapping the pins to ensure complete sealing and pulling together of sides of the crack.
				3. Cut slots shaped and sized to hold locks. Do not cut slots deeper than 90 percent of the thickness of the cast iron.
				4. Install locks with **[three large lobes] [seven large lobes] [number of lobes] <Insert requirement>** and spaced as recommended in writing by metal-stitching-system manufacturer for each lock location. Install locks in **[two] [three] <Install number>** layers unless otherwise recommended in writing by metal-stitching-system manufacturer.
				5. Grind off metal-stitching materials that project above surface of cast iron without damaging the cast-iron surface.
			1. PROTECTIVE COATING

Retain "Protective Hot-Wax Coating" or "Protective Lacquer Coating" Paragraph below, or both, to suit Project; if retaining both, indicate location of each on Drawings or by inserts. Pretreatment option is commonly used to stabilize residual cuprous chloride.

* + - * 1. Protective Hot-Wax Coating:**[ Pretreat cleaned copper-alloy surfaces with copper-alloy corrosion inhibitor, wipe off excess with ethanol-saturated rag, and allow surface to dry. If fresh corrosion appears, repeat process.]** Apply wax coating to produce uniform appearance without runs or other surface imperfections.

Clean and dry surface being waxed.

Preheat surface to about 212 deg F; hot enough to melt the wax and remove water vapor and other gases within metal surface, but not hot enough to boil the wax or ignite solvents, if any.

Apply uniform wax coating to surface, ensuring that wax coverage is complete, including recesses.**[ Apply second wax coating following the same process.]**

Inspect surface and repair holidays by reheating and applying more wax.

Buff waxed surface to a slight shine with a lint-free cloth after wax has cooled to a hazy appearance.

* + - * 1. Protective Lacquer Coating:**[ Pretreat cleaned copper-alloy surfaces with copper-alloy corrosion inhibitor, wipe off excess with ethanol-saturated rag, and allow surface to dry. If fresh corrosion appears, repeat process.]** Apply lacquer coating to produce uniform appearance without runs or other surface imperfections.

Clean and dry surface being coated.

Apply two uniform coats by air-spray method according to manufacturer's written instructions, with interim drying between coats.

Apply coating to a total dry film thickness of 1 mil.

Protect coated surface from contamination until fully cured.

* + - 1. PRIMING AND PAINTING CAST-IRON SCULPTURE

Retain one or more paragraphs below; revise to suit Project.

* + - * 1. Repair Primer: Apply immediately after completing a repair.
				2. Finish Primer: Apply as soon as possible after cleaning.

Retain "Finish Painting" and "Touch up" paragraphs below for onsite painting of unfinished surfaces; revise to suit Project.

* + - * 1. Finish Painting: Apply as soon as possible after repair according to applicable requirements in **[Section 090391 "Historic Treatment of Plain Painting."] <Insert Section number and title.>**
				2. Touch up: At completion of installation, touch up and restore damaged or defaced painted surfaces.
			1. PAINTING STEEL UNCOVERED DURING THE WORK

Retain this article if steel may be uncovered during the Work. These steel items can include structural armatures for supporting large or projecting components of sculpture. Revise to accommodate another method or methods if required. Insert requirements to prevent galvanic corrosion if incompatible metals are in direct contact. See the Evaluations.

* + - * 1. Notify Director’s Representative if steel is exposed during metal repair or removal. Where Director’s Representative determines that the steel is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:

Coordinate "Surface Preparation" Subparagraph below with surface preparation standard for antirust coating in "Preparatory Cleaning Materials" Article.

Surface Preparation: Remove paint, rust, and other contaminants according to **[SSPC-SP 2, "Hand Tool Cleaning,"] [SSPC-SP 3, "Power Tool Cleaning,"] [or] [SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning,"] <Insert surface preparation standard,>** as applicable to comply with paint manufacturer's recommended preparation.

Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

Consult Project structural Director’s Representative about option in paragraph below; revise to suit Project.

* + - * 1. If on inspection and rust removal the thickness of a steel member is found to be reduced from rust by more than **[1/16 inch ] <Insert dimension>**, notify Director’s Representative before proceeding.
			1. FIELD QUALITY CONTROL
				1. Testing Agency: Director’s Representative will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
				2. Notify testing agency in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors have had reasonable opportunity to inspect work areas at locations of lift devices or scaffolding.
			2. HISTORIC METAL-SCULPTURE SCHEDULE

This schedule demonstrates a method to indicate extensive historic treatment requirements for metal sculpture. A schedule helps to prevent confusion where Project includes several items of varying sizes, characteristics, and complexities; where extensive drawing notations would otherwise be needed; and where direction by a historic treatment specialist is considered insufficient. The design professional must decide what to include in a schedule and what should be indicated on Drawings. This schedule is an example only; revise to suit Project.

Insert drawing designation for each existing item to be treated, and indicate the methods of treatment that apply to the item. Use these designations on Drawings to identify locations.

* + - * 1. Treatment of Bronze Statue Finish **<Insert drawing designation>**: Clean and repair patina finish and coat statue.

Perform work **[in the shop] [or] [in the field]**.

Cleaning: **[Water cleaning] [Detergent cleaning] [Chemical cleaning] [Abrasive blasting] <Insert description>**.

Finish Repair: Selectively patinate the **[nose] [trident] [and] [previous metal repairs] <Insert description>** to match the rest of the statue.

Gilding: **[Restore gilding on trident fork] <Insert requirement>** as specified in **[Section 090398 "Historic Treatment of Gilding."] <Insert Section number and title.>**

Protective Coating: Protective **[hot-wax] [lacquer]** coating.

* + - * 1. Treatment of Cast-Iron Statue **<Insert drawing designation>**: Clean, repair [patina] [plated] finish, and coat statue.

Perform work **[in the shop] [or] [in the field]**.

Cleaning: **[Water cleaning] [Detergent cleaning] [Chemical cleaning] [Abrasive blasting] <Insert description>**.

Paint Removal: **[Remove paint only in vicinity of repairs] <Insert requirement>** Remove paint as specified in Section 050371 "Historic Decorative Metal Cleaning."

Rust Removal: **[Chemical] [Mechanical] <Insert method>**.

Repair: **[Patch defects with sculpted metal-patching compound, pin-on piece of broken digit, and repair cracks by metal stitching] <Insert description>** as indicated on Drawings.

Retain "Painted Finish" or "Gilding" Subparagraph below, or both, to suit Project; if retaining both, indicate location of each on Drawings or by inserts. Insert other finishes to suit Project.

Painted Finish: As specified in **[Section 090391 "Historic Treatment of Plain Painting."] <Insert Section number and title.>**

END OF SECTION 050387