SECTION 050372 - HISTORIC DECORATIVE METAL REPAIR

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

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY
				1. Section Includes:

Historic treatment of decorative metal in the form of repair as follows:

Repairing metals other than cast iron and replacing damaged and missing components in place.

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

Painting steel uncovered during the Work.

Installing wood rails supported by or attached to decorative metal railings or brackets.

* + - * 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 decorative metals 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 decorative metals 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.

Paragraph below is an example 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>**.
			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.

* + - * 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 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 decorative metal.

Review methods and procedures related to historic decorative metal repair 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.

Decorative metal historic treatment program.

Coordination with building occupants.

* + - 1. SEQUENCING AND SCHEDULING

Paragraph below is an example only; delete or revise to suit Project. Insert other sequences for different areas of building or types of work if needed.

* + - * 1. Perform decorative metal repair in the following sequence, which includes work specified in this and other Sections:

Retain subparagraphs below and insert others if required; revise to suit Project. If adjacent materials are to be replaced, consider inserting them in sequence to ensure that restored and new materials are not damaged by the work.

Dismantle existing surface-mounted objects and hardware that overlie decorative metal surfaces except items indicated to remain in place. Tag items with location identification and protect.

Verify that temporary protections have been installed.

Examine condition of decorative metal.

Clean decorative metal surface, and remove paint and other finishes to the extent required.

Repair and replace existing decorative metal and supports to the degree required for a uniform and sound surface on which to paint or apply other finishes.

Cure repaired surfaces and allow them to dry for proper finishing.

Paint and apply other finishes.

Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

* + - 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 indicating materials, profiles, methods of attachment, accessory items, and finishes.

Include field-verified dimensions and the following:

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

Templates and directions for installing anchor bolts and other anchorages.

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

Provisions for expansion, weep holes, and conduits as required for each location and exposure.

Provisions for sealant between decorative metal components and for sealant-type joints if required.

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

* + - * 1. Samples for Initial Selection: For each type of decorative metal item and component with factory-applied finishes.

Include samples of sealant materials, miscellaneous materials, and accessories 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 material to be used for replacing existing or missing decorative metal; 6 inches long in least dimension or whole item.

Retain "Patterns for Casting" Subparagraph and option in "Casting Samples" Subparagraph for tight control of appearance and size (accommodating shrinkage) of cast components. If retaining "Patterns for Casting" Subparagraph and option in "Casting Samples," 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.]**

Fittings and brackets.

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.

Wood Rail: 12 inches long.

Sealant materials.

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

Retain "Delegated-Design Submittal" Paragraph below if design services have been delegated to Contractor. Options are examples only.

* + - * 1. Delegated-Design Submittal: For structural performance of repaired **[railings] [handrails] [handrail brackets] [and] [anchors] <Insert item>**, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
			1. Consider "Qualification Data" and "Decorative Metal Historic Treatment Program" paragraphs below as they relate to Project goals and importance.
				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. Decorative Metal Historic Treatment Program: For repairing historic decorative metalwork.
			1. MAINTENANCE MATERIAL SUBMITTALS
				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.

Subparagraphs below are examples 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] [cast grilles of each type] <Insert requirement>**.

Wrought-Iron Decorative Railing Posts: **[Five] <Insert number>** additional posts**[ of each type] <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.

Retain both options in "Historic Treatment Specialist Qualifications" Paragraph below only if required for forge-welded historic replications, including method of manufacture.

* + - * 1. Historic Treatment Specialist Qualifications: A qualified historic decorative metal repair specialist.**[ Repair specialist shall be experienced in forge welding.]** Experience**[ in torch- or arc-welding and]** installing and finishing new decorative metal work is insufficient experience for decorative metal historic treatment work.

Retain "Single Specialist" Subparagraph below if required; revise to suit Project. If also retaining "Historic Treatment Specialist Firms" Paragraph, coordinate the listed specialists in the cited Sections.

Single Specialist: Have the work of **[Section 050371 "Historic Decorative Metal Cleaning"] [Section 050372 "Historic Decorative Metal Repair"] [Section 050373 "Historic Decorative Metal Refinishing"] [Section 050374 "Historic Decorative Metal Replication"] [and] [Section 050383 "Historic Cast Iron Repair"]** performed by the same historic treatment specialist firm, meeting the specialist qualifications of those Sections.

* + - * 1. Decorative Metal Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic decorative metal repair work, including each process or phase of repairing decorative metal, 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 construction.

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

Mockups in "Replacing Metal Component" and "Cast-Metal Components" subparagraphs below are examples only.

Replacing Metal Component: **[Two] <Insert number>** each of **[wrought-iron spirals replaced on gate] [and] [cast-bronze wall registers] <Insert item description>**.

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

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

Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Director’s Representative specifically approves such deviations in writing.

* + - 1. FIELD CONDITIONS

Usually, retain this article; revise to suit Project.

* + - * 1. Weather Limitations: Proceed with historic treatment of decorative metal 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: **[Railings] [handrails] [and] [handrail brackets] <Insert item>**, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

Subparagraphs below are examples only and are based on the 2012 International Building Code (IBC); revise to suit Project and to comply with requirements of authorities having jurisdiction. For some occupancy categories under certain circumstances, less-stringent provisions may apply.

Uniform load of 50 lbf/ft. applied in any direction.

Concentrated load of 200 lbf applied in any direction.

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

* + - 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.
				2. Source Limitation for Replacement Cast Materials: Obtain castings for historic treatment of decorative metal from single source from single manufacturer with resources to provide materials of consistent quality in appearance and physical properties.

Retain required materials in remaining paragraphs below; revise material requirements or insert other materials to suit Project. See Evaluations for discussion on historic treatment using modern materials. Revise alloy and temper designations to suit structural performance and finish requirements.

* + - * 1. Aluminum: Alloy and temper recommended in writing by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required:

Extruded Bars and Shapes: ASTM B221, Alloy 6063-T6.

Generally, retain "Extruded Structural Pipe and Tubes" or "Drawn General-Purpose Seamless Tubes" Subparagraph below if pipe or tube is required.

Extruded Structural Pipe and Tubes: ASTM B429, Alloy 6063-T6.

Drawn General-Purpose Seamless Tubes: ASTM B210, Alloy 6063-T832.

Plate and Sheet: ASTM B209, Alloy 6061-T6.

Die and Hand Forgings: ASTM B247, Alloy 6061-T6.

Castings: ASTM B26, Alloy A356-T6.

Retain "Copper Alloys, Bronze" Paragraph below for bronze look. None of the alloys below are true tin-bronzes. Verify availability and color matching with manufacturers. See Evaluations.

* + - * 1. Copper Alloys, Bronze:

Extruded Shapes: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze, 57 percent copper, 40 percent zinc, and 3 percent lead).

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

Seamless Pipe: ASTM B43, Alloy UNS No. C23000 (red brass, 85 percent copper and 15 percent zinc).

Seamless Tubes: ASTM B135, Alloy UNS No. C23000 (red brass, 85 percent copper and 15 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. See Evaluations.

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. See Evaluations.

* + - * 1. Copper Alloys, Brass:

Extruded Shapes: ASTM B249, Alloy UNS No. C36000 (free-cutting brass, 60 percent copper, 36 percent zinc, and small amounts of other metals).

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

Seamless Tubes: ASTM B135, 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. Monel (Nickel-Copper Alloy):

Alloy UNS No. N04400 in subparagraphs below is the Monel metal alloy most used for architectural applications. Monel cannot be extruded; no ASTM standard exists for sand-cast Monel.

Plate, Sheet, and Strip: ASTM B127, Alloy UNS No. N04400.

Rod, Bar, and Wire: ASTM B164, Alloy UNS No. N04400.

Seamless Tubes: ASTM B165, Alloy UNS No. N04400.

Forgings: ASTM B564, Alloy UNS No. N04400.

Sand Castings: Monel alloy matching Alloy UNS No. N04400.

* + - * 1. Nickel Silver (Copper-Nickel-Zinc Alloy):

Alloy UNS No. C74500 (also termed "65-10") and Alloy UNS No. C75200 (also termed "65-18") in subparagraphs below are commonly available nickel silvers. Verify availability and color matching with manufacturers.

Extruded Shapes: ASTM B151, Alloy **[UNS No. C74500] [UNS No. C75200]**.

Plate, Sheet, Strip, and Bar: ASTM B122, Alloy **[UNS No. C74500] [UNS No. C75200]**.

* + - * 1. Stainless Steel:

Indication of size and wall thickness differs for tubing and pipe. For stainless steel tubing, indicate by OD and wall thickness; for pipe, indicate by nominal size and schedule number. Type 304 is generally standard; Type 316 has better corrosion resistance in coastal environments but is less available.

Tubing: ASTM A554, **[Grade MT-304] [Grade MT-316]**.

Pipe: ASTM A312, **[Grade TP304] [Grade TP316]**.

Grades in first option in "Castings" Subparagraph below are used as cast equivalent of Type 304 and Type 302, respectively; grade in second option is used as cast equivalent of Type 316.

Castings: ASTM A743, **[Grade CF8 or CF20] [Grade CF8M]**.

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:

Tubing: Cold formed, ASTM A500.

Steel Plate, Shapes, and Bars: ASTM A36.

Mild steel product in "Steel Bars" Subparagraph below is a possible substitute for genuine wrought iron; it is frequently used for railings that are similar to historic wrought iron but have lower corrosion resistance.

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

Steel Sheet: ASTM A1008, cold-rolled commercial steel sheet; matte finish; suitable for exposed applications.

Retain "Cast Iron" Paragraph below only for minor replacement pieces of cast iron. Cast-iron repairs and major replacement are specified in Section 050383 "Historic Cast Iron Repair."

* + - * 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.

Retain first option in "Wrought Iron" Paragraph below for genuine wrought iron; retain second option for pure iron; and retain last option for mild steel worked to provide the appearance of wrought iron. Genuine wrought iron may be unavailable; it is rarely produced in the United States. See "Manufacturers" Article in the Evaluations for sources of pure and wrought iron.

* + - * 1. Wrought Iron: **[Pure iron with not more than 0.035 percent carbon and containing fibrous slag (iron silicate)] [Pure iron with not more than 0.035 percent carbon and no slag (iron silicate)] [or] [mild steel; ASTM A29, Grade 1010]**; hand worked or machine forged to the form indicated.
			1. WOOD MATERIALS

Generally, delete this article if handrails of other materials are required.

Retain one of two "Wood Rails" paragraphs below if wood rails requiring repair and finishing or replacement are supported by or attached to decorative metal railings or brackets. Retain first paragraph if wood rails are specified in this Section; retain second paragraph if wood rails are specified in another Section. Indicate details on Drawings.

* + - * 1. Wood Rails: Hardwood rails of species and profile indicated, with **[transparent finish] <Insert finish>**, and prepared for securing to metal subrail or brackets as indicated on Drawings.

Species and Finish: **[Match design reference sample] [Match existing] [As indicated on Drawings] [Ash, natural finish] [Cherry, natural finish] [Walnut, natural finish] [White oak, light-stained finish] <Insert species and finish>**.

If rails are required to serve as handrails rather than only as top rails of guards, verify that profile complies with regulations for accessibility.

Profile: **[Match design reference sample] [Match existing] [As indicated on Drawings] [Square shape, 1-3/4 by 1-3/4 inches , with edges eased to 1/4-inch radius] [Rectangular shape, 1-3/4 by 5 inches , with edges eased to 1/4-inch radius] [Round shape, 2-inch diameter]**.

* + - * 1. Wood Rails: Hardwood rails of species and profile **[matching design reference sample] [matching existing] [as indicated on Drawings] <Insert description>, complying with [Section 050383 "Historic Cast Iron Repair."] [Section 060312 "Historic Wood Repair."] [Section 064013 "Exterior Architectural Woodwork."] [Section 064023 "Interior Architectural Woodwork."] <Insert Section number and title.>**
			1. PREPARATORY CLEANING MATERIALS

For a metal item having a mix of materials, such as painted wrought-iron railings with copper-alloy handrails or plated metal details, consider using cleaning materials and a single cleaning method selected for gentleness to all the materials and finishes on the item. 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.

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

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.

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 stainless steel and other 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. If mechanically cleaning stainless steel surfaces, allow only stainless steel tools. Carbon-steel residues can rust and stain stainless steel surfaces.

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. 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 decorative metal 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 Phillips-type machine screws of 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. ICC-ES AC01 and AC193 are for expansion anchors in masonry and mechanical anchors in concrete respectively, and AC58 and 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 ICC-ES **[AC01] [AC193] [AC58] [or] [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 **[railings] [handrails] [and] [handrail brackets] <Insert item>** to structure.

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] [Group 2]** 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. AC01 and AC193 are for expansion anchors in masonry and mechanical anchors in concrete respectively, and AC58 and 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 bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES [AC01] [AC193] [AC58] [or] [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] [Group 2]** stainless steel bolts, ASTM F593, and nuts, ASTM F594.

* + - 1. ACCESSORIES

Retain "Metal-Patching Compound" Paragraph below for filling nonstructural defects in existing metal surfaces to be painted; revise to suit Project.

* + - * 1. Metal-Patching Compound: Two-part, epoxy- or polyester-resin, metal-patching compound; 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 for Copper Alloys" Paragraph below if copper-alloy components will be brazed.

* + - * 1. Brazing Rods for Copper Alloys: 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 aluminum, steel, or wrought-iron components will be welded or filled using welding. Consider deleting the phrase "color match" if all components will be painted or plated. Forge welding, which is typically used to weld wrought iron, uses heat and hammering and generally does not involve filler metal.

* + - * 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" or "Anchoring Cement" Paragraph below, or both, 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.
				2. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

Retain "Water-Resistant Product" Subparagraph below if railings are used at exterior or wet locations.

Water-Resistant Product: **[At exterior locations] [and] [where indicated]**, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer for exterior use.

Retain "Sealant Materials" Paragraph below if joint 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 mockup:

Previous effectiveness in performing the work involved.

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 remaining paragraphs below to suit Project.

* + - * 1. Custom fabricate repairs of decorative metal items and components in sizes and profiles to match existing decorative metal 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.

Retain "Castings" Paragraph below only for cast aluminum, bronze, and minor replacement pieces of cast iron. Cast-iron repairs and major replacement are specified in Section 050383 "Historic Cast Iron Repair."

* + - * 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.

Finish castings to match existing decorative metal work.

"Replacement Casting for Handrail Bracket" Subparagraph below is an example only; if retaining, revise to include location or identification of pattern for replacement castings. Insert subparagraphs for other castings if required.

Replacement Casting for Handrail Bracket: Duplicate existing handrail bracket on the wrought-iron railing of first-floor stairs in the lobby. Make molds from this bracket to create new cast-bronze brackets.

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

* + - * 1. Date Identification: Emboss 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 embossed.**[ 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 mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
				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. ALUMINUM FINISHES

Retain finishes in this article for aluminum assemblies or components to suit Project. Refinishing is specified in Section 050373 "Historic Decorative Metal Refinishing." These aluminum finishes are shop applied. If retaining more than one, indicate location of each on Drawings or by inserts. Insert other finishes to suit Project.

* + - * 1. Mill finish.

Retain one of first two options in "Clear Anodic Finish" Paragraph below. Class II finish is standard with many manufacturers; Class I finish is heavy anodized. Verify availability with manufacturer. Revise last three options if custom mechanical finish is required and availability is verified.

* + - * 1. Clear Anodic Finish: AAMA 611, **[Class I, 0.018 mm] [Class II, 0.010 mm] or thicker over a [satin (directionally textured)] [polished (buffed)] [nonspecular as fabricated] <Insert requirement>** mechanical finish.

Retain one of first two options in "Color Anodic Finish" Paragraph below. Class II finish is standard with many manufacturers; Class I finish is heavy anodized. Verify availability with manufacturer. Revise last three options if custom mechanical finish is required and availability is verified. Indicate color on Drawings or in the Historic Decorative Metal Repair Schedule.

* + - * 1. Color Anodic Finish: AAMA 611, **[Class I, 0.018 mm] [Class II, 0.010 mm] or thicker over a [satin (directionally textured)] [polished (buffed)] [nonspecular as fabricated] <Insert requirement>** mechanical finish.

"Baked-Enamel or Powder-Coat Finish" Paragraph below references AAMA standard for pigmented organic coating on extrusions and panels. Indicate color on Drawings or in the Historic Decorative Metal Repair Schedule.

* + - * 1. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

Consider inserting other high-performance finishes from Section 057000 "Decorative Metal."

* + - 1. COPPER-ALLOY FINISHES

Retain finishes in this article for copper-alloy assemblies or components to suit Project. Refinishing is specified in Section 050373 "Historic Decorative Metal Refinishing." If retaining more than one, 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. Retain first paragraph for finish that weathers and changes color naturally over time unless clear coated with wax, oil, or organic 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 (Mechanical Finish: buffed, smooth specular)] [M22 (buffed, specular mechanical finish)] <Insert description>**.
				2. Buffed Finish, Lacquered: **[M22 (Mechanical Finish: buffed, specular; specified clear organic 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 organic 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 (Mechanical Finish: directionally textured, medium satin and hand-rubbed)] <Insert description>**.
				2. Satin Hand-Rubbed Finish, Lacquered: [M32-M34-06x (Mechanical Finish: directionally textured, medium satin and hand-rubbed; specified clear organic coating)] <Insert description>.

Remaining four paragraphs below specify patinated finishes. 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 organic 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 an organic coating. Verify, with manufacturers, the suitability of patinas for exterior exposure, if required, and requirements for clear protective coatings.

* + - * 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] <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] <Insert description>**.

"Bright-Relieved Statuary Conversion Coating, Lacquered" Paragraph below is an example of a more complex finish requiring the highest skill level. It specifies finish for castings; revise for other forms of metal or 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 organic 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] <Insert description>**.

Retain paragraph below for proprietary patina finish not listed above. Patina finishes are available from manufacturers listed in "Manufacturers" Article in the Evaluations.

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

Retain finishes in this article for ferrous metal assemblies or components to suit Project. Insert other finishes to suit Project. Copy article and revise for different iron and steel finishes. If retaining more than one, indicate location of each on Drawings or by inserts. Repaired iron and steel generally require 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.

* + - * 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 metal.

Finish in "Baked-Enamel or Powder-Coat Finish" Paragraph below is shop applied to thoroughly cleaned bare metal only. These finishes are for new assemblies or components to suit Project. Refinishing is specified in Section 050373 "Historic Decorative Metal Refinishing."

* + - * 1. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

Retain "Patina Finish" Paragraph below for patina finish on iron. Patina finishes are available from manufacturers listed in "Manufacturers" Article in the Evaluations. Verify, with manufacturers, the suitability of patinas for exterior exposure, if required, and requirements for clear protective coatings.

* + - * 1. Patina Finish: **<Insert description>**.

For exact finish, insert names of finish manufacturers and products.

* + - 1. STAINLESS STEEL FINISHES

Retain finishes in this article for stainless steel assemblies or components to suit Project. Refinishing is specified in Section 050373 "Historic Decorative Metal Refinishing." These finishes can be shop or field applied. If retaining more than one, indicate location of each on Drawings or by inserts.

* + - * 1. Surface Preparation: Remove tool and die marks and stretch lines from new replacement stainless steel, or blend into finish.

Retain "Restored Finish" Paragraph below for finish applied to match existing stainless steel or sample.

* + - * 1. Restored Finish: Grind and polish surfaces to produce uniform, directionally textured, polished finish to match **[existing finish] [Sample]**, free of cross scratches.

Run grain to match existing metal.

When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

Generally, retain "Polished Finishes" or "Bright, Cold-Rolled, Unpolished Finish" Paragraph below for stainless steel not required to match existing stainless steel; revise to suit Project.

* + - * 1. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

Retain first subparagraph below for directional finishes.

Run grain of directional finishes with long dimension of each piece.

When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

Directional Satin Finish: ASTM A480, No. 4.

Dull Satin Finish: ASTM A480, No. 6.

Reflective, Directional Polish: ASTM A480, No. 7.

Mirrorlike Reflective, Nondirectional Polish: ASTM A480, No. 8.

Retain "Bright, Cold-Rolled, Unpolished Finish" Paragraph below for nondirectional finish.

* + - * 1. Bright, Cold-Rolled, Unpolished Finish: ASTM A480, No. 2B.
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 decorative metal repair by one of the following] [firms that may provide historic decorative metal repair 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 DECORATIVE METAL REPAIR, GENERAL

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

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

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

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

Remove deteriorated coatings and corrosion.

Sequence work to minimize time before protective coatings are reapplied.

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

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

Replace or reproduce historic items where indicated or scheduled.

Make historic treatment of materials reversible whenever possible.

Install temporary protective measures to stabilize decorative metal that is indicated to be repaired later.

* + - * 1. Mechanical Coating Removal: Use 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 Decorative Metal Items: Match existing materials and features, retaining as much original material as possible to complete the repair.

Unless otherwise indicated, repair decorative metals by patching, filling, piecing-in, splicing, or otherwise reinforcing metals with new material matching existing.

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

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

Replace heavily deteriorated or missing parts or features of decorative metal with compatible materials, using surviving prototypes to create patterns or molds for duplicate replacements.

Retain one of two subparagraphs below. Indicate on Drawings or in the Historic Decorative Metal Repair Schedule where substitute materials may be used. If retaining second subparagraph, insert requirements for substitute materials in Part 2.

Do not use substitute materials unless otherwise indicated.

Compatible substitute materials may be used.

* + - 1. PREPARATORY CLEANING

Retain cleaning methods in this article for cleaning metal before performing repair 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 metal that is attached to masonry with soft joints.

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

Fan-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 decorative metals with desirable patina. Water cleaning 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 and loose paint 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 decorative metals 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.

Retain "Cleaning by Abrasive Blasting" Paragraph below only if allowing abrasive blasting. Retain last option below for decorative 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**[ and loose paint]** 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.] <Insert requirement>.[ Leave uniform patina intact.]**

Retain one of two "Pressure and Distance from Surface" subparagraphs below.

Pressure and Distance from Surface: Maximum pressure of **[60 psi ] [100 psi ] [200 psi ]** with specified blasting abrasive propelled from a distance of **[6 to 12 inches ] [12 to 18 inches ]** from surface.

Pressure and Distance from Surface: As established by mockup.

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 decorative metal in place insofar as practicable, unless otherwise indicated. Where necessary, dismantle components from their substrate and repair and reinstall according to approved historic treatment program.

Indicate on Drawings or in the Historic Decorative Metal Repair Schedule which items are to be removed or 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 decorative metal iron items level and plumb and in alignment with adjacent construction.

Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

Use concealed anchorages where possible, unless otherwise indicated.

Form tight joints with exposed connections accurately fitted together.

Install concealed joint fillers, sealants, and flashings, as the Work progresses, to make exterior items weatherproof.

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" Subparagraph below for prefinished assemblies and components; revise to suit Project.

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

Retain "Reinstalling (Railing) (and) (Fence) Posts" Paragraph below if reinstalling railings or fence posts; revise to suit Project.

* + - * 1. Reinstalling **[Railing] [and] [Fence]** Posts: After posts have been inserted into sleeves, fill annular space between post and sleeve with **[nonshrink, nonmetallic grout] [or] [anchoring cement]**, mixed and placed to comply with anchoring material manufacturer's written instructions. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8-inch buildup sloped away from post.

Retain "Anchoring Wood Rails" Paragraph below if repaired or replaced wood rails are supported by or attached to decorative metal railings or brackets. Indicate details on Drawings. Revise if railings of other materials such as bronze or steel are required.

* + - * 1. Anchoring Wood Rails: Secure wood rails to metal subrail or brackets from bottom of rail as indicated on Drawings. Make fastener heads flush to metal surface of subrail or brackets.

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."

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.

Consider retaining first subparagraph below for exterior installations.

Apply sealant on joint surfaces between abutting cast-metal components in a continuous application immediately before joining the components together. Remove excess after components are joined and tightened.

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 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.

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 mockup.

* + - 1. FILLING DEFECTS IN PAINTED SURFACES

Retain this article for filling nonstructural defects in existing metal surfaces to be painted.

* + - * 1. Repair non-load-bearing defects in existing metal surfaces, including dents and gouges more than **[1/16 inch] [1/8 inch] deep or [1/2 inch] [1 inch]** across and all holes and tears by filling with metal-patching compound. Remove burrs. Prime iron and steel surfaces 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. PRIMING
				1. Repair Primer: Apply immediately after completing a repair.
				2. Finish Primer: Apply as soon after cleaning as possible.
			2. PAINTING STEEL UNCOVERED DURING THE WORK

Retain this article if steel may be uncovered during the Work. Revise to accommodate another method or methods if required. See Evaluations.

* + - * 1. Notify Director’s Representative if steel is exposed during metal 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 engineer about option in first 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]** 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 DECORATIVE METAL REPAIR SCHEDULE

This schedule demonstrates a method to indicate extensive historic treatment requirements for decorative metal. A schedule helps to prevent confusion where Project includes several items of varying sizes, characteristics, and complexities; where extensive drawing notations would otherwise be used; and where direction by a historic treatment specialist is considered insufficient. The design professional decides what to include in a schedule and what to annotate indicated on Drawings. This schedule is an example only; revise to suit Project and coordinate with historic decorative metal schedules in Section 050371 "Historic Decorative Metal Cleaning" and Section 050373 "Historic Decorative Metal Refinishing," if retained.

Insert drawing designation for each 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 Decorative Railing **[DMR-1] <Insert drawing designation>**: Wrought-iron railing and gate.

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

Paint Removal: As specified in Section 050371 "Historic Decorative Metal Cleaning."

Repairs: Repair railing and replace missing components with hand-worked **[steel bars] [wrought iron]**.

Retain "Painted Finish" or "Baked-Enamel or Powder-Coat Finish" Subparagraph below. Second subparagraph generally requires railing removal, shop finishing, and reinstallation. Insert other finishes to suit Project.

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

Baked-Enamel or Powder-Coat Finish: **[Color as indicated by manufacturer's designations] [Color matching design reference sample] [Color as selected by Director’s Representative from manufacturer's full range] <Insert color and gloss>**.

Gilding: As specified in **[Section 090398 "Historic Treatment of Gilding."] <Insert Section number and title.>**

* + - * 1. Treatment of Decorative Railing **[DMR-2] <Insert drawing designation>**: Bronze railing with bronze handrail.

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

Cleaning: As specified in Section 050371 "Historic Decorative Metal Cleaning."

Repair: **[Splice new material into deteriorated section] <Insert description>**.

Bronze Finish: **[Satin finish with statuary conversion coating on railing; satin hand-rubbed finish, lacquered, on handrail] <Insert requirement>**.

* + - * 1. Treatment of Decorative Railing and Handrail **[DMRH-1] <Insert drawing designation>: Deteriorated [bronze] [wood]** handrail on wrought-iron railing.

Repair: Replace broken wrought-iron railing components and repaint railing. Replace entire, deteriorated **[bronze] [wood]** handrail with shop-fabricated **[aluminum] [steel] [wood] <Insert material>** handrail. Replicate wrought-iron as specified in Section 050374 "Historic Decorative Metal Replication."

Paint Removal: As specified in Section 050371 "Historic Decorative Metal Cleaning."

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

Color: **[As indicated by manufacturer's designations] [Matching design reference sample] [As selected by Director’s Representative from manufacturer's full range] <Insert color and gloss>**.

Gilding: As specified in **[Section 090398 "Historic Treatment of Gilding."] <Insert Section number and title.>**

Handrail Finish:

Retain "Aluminum Finish" or "Baked-Enamel or Powder-Coat Finish" Subparagraph below. Aluminum finishes are shop applied on new assemblies or components to suit Project. Refinishing is specified in Section 050373 "Historic Decorative Metal Refinishing." Second option in "Aluminum Finish" Subparagraph is most available; verify availability of other aluminum finishes with manufacturer. Insert other finishes to suit Project.

Aluminum Finish: **[Light bronze anodized] [Medium bronze anodized] [Dark bronze anodized] [Anodized color matching design reference sample] [Anodized color as selected by Director’s Representative from full range of industry colors and color densities] <Insert color>**.

Baked-Enamel or Powder-Coat Finish: **[Color as indicated by manufacturer's designations] [Color matching design reference sample] [Color as selected by Director’s Representative from manufacturer's full range] <Insert color and gloss>**.

END OF SECTION 050372