SECTION 050383 - HISTORIC CAST IRON 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 cast iron in the form of repair as follows:

Repairing cast iron and replacing damaged and missing components in place.

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

Painting steel uncovered during the Work.

Reanchoring cast iron to building structure.

Installing [wood rails] [or] [rails of other metals] supported by or attached to cast-iron 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 cast-iron repair 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 cast-iron repair under quantity allowances and only as authorized. Authorized work includes **[work required by Drawings and Specifications and] [only]** 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 cast-iron **<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 cast-iron 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.

Cast-iron 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 cast-iron 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 cast-iron 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 cast iron.

Clean cast-iron surface, and remove paint and other finishes to the extent required.

Repair and replace existing cast iron 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 cast-iron 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 cast-iron 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 cast-iron components and for sealant-type joints if required.

Retain subparagraph below only if metal stitching is required.

Layout of metal stitching, including stitching-pin size(s) and lock length(s), spacing, and number of layers.

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

* + - * 1. Samples for Initial Selection: For each type of cast-iron 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 cast iron; 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 both, 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; 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] [handrail brackets] [and] [anchors] <Insert item>**, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

Consider "Qualification Data" and "Cast-Iron Historic Treatment Program" paragraphs below as they relate to Project goals and importance.

* + - * 1. Qualification Data: For historic treatment specialist **[historic brazing-and-welding specialist] [and] [historic metal-stitching specialist]**.

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

* + - * 1. Evaluation Reports: For post-installed structural anchors, from ICC-ES.
        2. Cast-Iron Historic Treatment Program: For repairing historic cast iron.
      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>**.

Cast-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.

* + - * 1. Historic Treatment Specialist Qualifications: A qualified historic cast-iron repair specialist. Experience in repairing, brazing, and welding wrought iron, steel, or cuprous metals and installing and finishing new cast-iron work is insufficient experience for historic cast-iron repair work.

Retain "Historic Brazing-and-Welding Specialist" or "Historic Metal-Stitching-Repair Specialist" Subparagraph below, or both, if required; revise to suit Project.

Historic 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.

Retain "Single Specialist" Subparagraph below if required; revise to suit Project. If also retaining "Historic Treatment Specialist Firms" Paragraph in "Historic Treatment Specialist" Article, 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] [this Section]** performed by the same historic treatment specialist firm, meeting the specialist qualifications of those Sections.

* + - * 1. Cast-Iron Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic cast-iron repair work, including each process or phase of repairing cast iron, 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 "Repairing Metal Component," "Replacing Metal Component," and "Cast-Metal Components" subparagraphs below are examples only.

Repairing Metal Component: **[Two] <Insert number>** cast-iron **[pinning] [and] [metal-stitching] <Insert item description>** repairs on sample pieces of cast iron.

Replacing Metal Component: **[Two] <Insert number>** cast-iron **[finials replaced on fence] [and] [wall registers] <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 cast-iron item 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.

Retain subparagraph below if the intention is to make an exception to the default requirement in Section 014000 "Quality Requirements" for demolishing and removing mockups. These mockups are typically installed as part of existing building rather than erected separately.

Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

* + - 1. FIELD CONDITIONS

Usually retain this article; revise to suit Project.

* + - * 1. Weather Limitations: Proceed with historic cast-iron repair 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; 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.

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.

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 that 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 cast-iron repair 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. Delete materials in remaining paragraphs below if specified in Section 050372 "Historic Decorative Metal Repair." See the Evaluations for discussion on historic treatment using modern materials. Revise alloy and temper designations to suit structural performance and finish requirements.

* + - * 1. Cast Iron:

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

Drawn Seamless Tubing: ASTM B210, Alloy 6063-T832.

Castings: ASTM B26, Alloy A356-T6.

Retain one or more of "Copper Alloys, Bronze"; "Copper Alloys, Brass"; and "Steel paragraphs below, listed in decreasing cost, if required for rails. These metals are generally not cost effective as substitutes for cast-iron castings. Insert other metals if required.

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 the Evaluations.

* + - * 1. Copper Alloys, Bronze:

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).

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

* + - * 1. Copper Alloys, Brass:

Seamless Tubes: ASTM B135, Alloy UNS No. C26000 (cartridge brass, 70 percent copper and 30 percent zinc).

* + - * 1. Steel:

Tubing: Cold formed, ASTM A500.

Insert other types of steel, metallic-coated steel, or stainless-steel shapes, and bars if required for reinforcing cast-iron assemblies to remain. Coordinate with Drawings.

* + - 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 cast-iron 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 050372 "Historic Decorative Metal 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 cast-iron railings with copper-alloy handrails, 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.

* + - * 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.
        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. PINNING MATERIALS

Retain this article if Project requires reattachment of broken-off, non-load-bearing, cast-iron details such as fence finials; 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 cast iron.
      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 cast-iron 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. ICC-ES AC01 and ICC-ES AC193 are for expansion anchors in masonry and mechanical anchors in concrete, respectively; ICC-ES AC58 and ICC-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 **[ICC-ES AC01] [ICC-ES AC193] [ICC-ES AC58] [or] [ICC-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 **[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. ICC-ES AC01 and ICC-ES AC193 are for expansion anchors in masonry and mechanical anchors in concrete, respectively; ICC-ES AC58 and ICC-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 **[ICC-ES AC01] [ICC-ES AC193] [ICC-ES AC58] [or] [ICC-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] [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 cast-iron 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 cast iron 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 Cast Iron" Paragraph below if cast-iron components will be brazed.

* + - * 1. Brazing Rods for Cast Iron: Type and alloy as recommended in writing by brazing-rod manufacturer and as required for strength and compatibility with cast-iron items.

Retain "Welding Electrodes and Filler Metal" Paragraph below if cast-iron components will be welded or filled using welding methods.

* + - * 1. Welding Electrodes and Filler Metal: Select according to AWS specifications for welding cast-iron; use compatible metal type and alloy as required for strength, and compatibility with cast-iron 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.

* + - * 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 first 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 ]** 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. CAST-METAL FABRICATION

Revise remaining paragraphs below to suit Project.

* + - * 1. Custom fabricate repairs of cast-iron items and components in sizes and profiles to match existing cast iron 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, 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. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.

Use materials and methods that 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.

Finish castings to match existing cast-iron 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 cast-iron railing of first-floor stairs in the lobby. Make molds from this bracket to create new cast-iron 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. Add the identification to the mold pattern before casting.
      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 castings or rails 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 Cast-Iron 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 Cast-Iron Repair Schedule.

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

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

* + - 1. COPPER-ALLOY FINISHES

Retain finishes in this article for copper-alloy rails 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 (Mechanical Finish: buffed, specular)] <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 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] [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.f

* + - * 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. 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] [Match Sample] <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 cast-iron assemblies or components and for new steel rails 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 first 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.

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

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 cast-iron repair by one of the following] [firms that may provide historic cast-iron repair include, but are not limited to, the following]**:
      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 CAST-IRON 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 cast iron 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 cast iron 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 Cast-Iron Items: Match existing features, retaining as much original material as possible to complete the repair.

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

Where indicated, repair cast iron by limited replacement to the extent indicated, matching existing material.

* + - * 1. Replacing Cast-Iron Components: Where indicated, duplicate and replace items with new material matching existing.

Replace heavily deteriorated or missing parts or features of cast iron 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 Cast-Iron 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 cast iron 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 cast iron that is attached to masonry with soft joints.

* + - * 1. Perform preparatory cleaning before performing repair work.

Brushes: If using wire brushes, use steel or stainless-steel 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.

* + - * 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.
        2. Detergent Cleaning:

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

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.

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, soil, and loose paint.

Retain "Cleaning by Abrasive Blasting" Paragraph below only if allowing abrasive blasting.

* + - * 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; wipe with cloths to remove water] [Do not rinse cast iron with water; wipe with soft brushes and damp cloths to remove residue] <Insert requirement>**.

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 cast iron 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 Cast-Iron Repair 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 cast-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" Paragraph 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 in 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 cast-iron railings or brackets. Revise if railings of other materials such as bronze or steel are required. Indicate details on Drawings.

* + - * 1. Anchoring Wood Rails: Secure wood rails to cast-iron 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 joint surfaces 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-iron 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. PINNING

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

* + - * 1. Use cast-iron piece that has broken-off or a custom, cast replica of a similar item. Verify that repair piece is a correct match for remaining existing work and 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 ]**.

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 a 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 Painted Surfaces" Article.
      1. METAL STITCHING
         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] <Insert 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 cast-iron surface.
      2. PRIMING
         1. Repair Primer: Apply immediately after completing a repair.
         2. Finish Primer: Apply as soon after cleaning as possible.
      3. 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 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]**, 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 CAST-IRON REPAIR SCHEDULE

This schedule demonstrates a method to indicate extensive repair requirements for historic cast iron. 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 on Drawings. This schedule is an example only; revise to suit Project and coordinate with historic decorative metal schedule in Section 050371 "Historic Decorative Metal Cleaning," Section 050372 "Historic Decorative Metal Repair," Section 050373 "Historic Decorative Metal Refinishing," and Section 050374 "Historic Decorative Metal Replication," if retained.

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

* + - * 1. Treatment of Cast-Iron Railing **[CIR-1] <Insert drawing designation>**: Cast-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 broken railing finials by pinning, and replace missing components with custom, cast-**[iron] [aluminum]** components.

Retain "Painted Finish" or "Baked-Enamel or Powder-Coat Finish" Subparagraph below. Second paragraph generally requires railing dismantling, 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 matching 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 Cast-Iron Railing **[CIR-2] <Insert drawing designation>**: Cast-iron balustrade.

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

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

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

Repair: **[Patch with new material by filling, metal stitching, or replacing cast-iron components with new castings and fasteners] <Insert description>**.

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

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

* + - * 1. Treatment of Cast-Iron Railing and Handrail **[CIRH-1] <Insert drawing designation>**: Cast-iron railing with bronze handrail.

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

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

Repair: **[Patch cast iron with new material by filling, metal stitching, or replacing cast-iron components with new castings and fasteners] <Insert description>**.

Replicate cast-iron as specified in Section 050374 "Historic Decorative Metal Replication."

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

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

* + - * 1. Treatment of Cast-Iron Railing and Handrail **[CIRH-2] <Insert drawing designation>**: Deteriorated **[bronze] [wood]** handrail on cast-iron railing.

Repair: Replace broken cast-iron railing components and repaint railing. Replace entire, deteriorated **[bronze] [wood]** handrail with shop-fabricated **[aluminum] [steel] [wood]** **<Insert material>** handrail. Replicate cast-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] [Matching Sample] [As selected by Director’s Representative from manufacturer's full range] <Insert color>**.

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

Retain "Handrail Finish" Subparagraph below for metal handrails; revise to suit Project.

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 matching 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 matching Sample] [Color as selected by Director’s Representative from manufacturer's full range] <Insert color>.**

* + - * 1. Treatment of Cast-Iron Facade and Storefront **[CIFS-#] <Insert drawing designation>**: Repair facade and storefront and replace missing components.

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

Retain "Dismantle and Salvage Items" Subparagraph below if applicable for specific components of facade and storefront that require salvage; revise to suit Project.

Dismantle and Salvage Items: Dismantle the following**[, return to shop to perform indicated treatment of item,]** and deliver to Director’s Representative for storage for future installation:

Cast-iron medallions.

**<Insert item to be salvaged>**.

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

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

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

Repair: **[Patch with new material by filling, pinning pieces of broken ornaments, metal stitching cracks, or replacing cast-iron components with new castings and fasteners] [Splice new material into deteriorated section] [Reinforce] [Refasten] [Realign] <Insert description>**.

Replace **<Insert item description>** with new duplicate of existing item. **<Insert description such as material, substitution material if allowed, and source of pattern for duplication>**.

Replicate cast iron as specified in Section 050374 "Historic Decorative Metal Replication."

Seal joints between components unless otherwise indicated; install sealant-type joints where indicated on Drawings.

Finish Treatment:

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.>**

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

END OF SECTION 050383