SECTION 040322 - HISTORIC BRICK UNIT MASONRY 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 work consisting of repairing historic clay brick masonry as follows:

Repairing unit masonry.

Removing abandoned anchors.

Painting steel uncovered during the work.

Reanchoring veneers.

* + - * 1. Related Requirements:

Retain subparagraphs 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.

Section 076200 "Sheet Metal Flashing and Trim" for metal flashing installed in or on repaired masonry.

* + - 1. ALLOWANCES

Retain products and Work included 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.

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

* + - * 1. Allowances for historic masonry 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 masonry repair work under quantity allowances and only as authorized. Authorized work includes[ **work required by Drawings and the 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.

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

* + - * 1. Preconstruction testing is part of testing and inspecting allowance.
				2. Abandoned anchor removal is part of <**Insert name of allowance**>.
				3. Brick removal and replacement is part of brick removal and replacement allowance.
				4. Reanchoring veneers is part of veneer reanchoring allowance.
				5. Patching brick masonry is part of masonry patching allowance.
			1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project. Pressure spray value in "Low-Pressure Spray" Paragraph below is not standardized; revise pressure to suit Project.

* + - * 1. Low-Pressure Spray:

Pressure: [**100 to 400 psi**].

Flow Rate: [**4 to 6 gpm**].

Revise "Rebuilding (Setting) Mortar" Paragraph below to suit local usage and office practice.

* + - * 1. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

Saturation coefficient is also called "C/B ratio."

* + - * 1. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of bricks to freezing and thawing.
			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 subparagraphs below if additional requirements are necessary; include information about conference.

Review minutes of Preliminary Historic Treatment Conference that pertain to masonry historic treatment and repair.

Review methods and procedures related to repairing historic brick masonry, 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.

Quality-control program.

Fire-protection plan.

Unit masonry historic treatment program.

Coordination with building occupants.

* + - 1. SEQUENCING AND SCHEDULING

Procedure in first paragraph below may be required to ensure consistency of sand and gray portland cement, if any, throughout Project. Coordinate use of gray portland cement with "Mortar Materials" Article. Gray portland cement can vary more than white portland cement from plant to plant and from batch to batch.

* + - * 1. Order sand[ **and gray portland cement**] for colored mortar immediately after approval of [**Samples] [mockups**]. Take delivery of and store at Project site a sufficient quantity to complete Project.

"Work Sequence" Paragraph below is an example only; revise to suit Project or delete if not prescribing a work sequence. It assumes that cleaning, if required, precedes repairs. For this, masonry and joints must be sound enough to prevent water and chemicals from penetrating into building.

* + - * 1. Work Sequence: Perform masonry historic treatment work in the following sequence, which includes work specified in this and other Sections:

Retain and revise subparagraphs below, and insert others to suit Project. Insert other sequences for different areas of building if needed.

Remove plant growth.

Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent intrusion of water and other cleaning materials into the wall.

Remove paint.

Clean masonry.

Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.

Repair masonry, including replacing existing masonry with new masonry materials.

Rake out mortar from joints to be repointed.

Point mortar and sealant joints.

After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

Retain subparagraph below if water repellents are part of Project; revise if water-repellent, graffiti-resistant coating is required.

Where water repellents are to be used on or near masonry work, delay application of these chemicals until after pointing and cleaning.

If windows are to be replaced, insert subparagraph into above sequence for the timing of window replacement.

Retain paragraph below if scaffolding anchor holes in masonry and patching them are acceptable and required; revise to suit Project.

* + - * 1. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in bricks according to "Brick Masonry Patching" Article. Patch holes in mortar joints according to Section 040323 "Historic Brick Unit Masonry Repointing."
			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 construction details, material descriptions, dimensions of individual components and profiles, and finishes.

Include recommendations for product application and use.

Include test data substantiating that products comply with requirements.

* + - * 1. Shop Drawings:

Include plans, elevations, sections, and locations of masonry repair work on the structure.

Show full-size patterns with complete dimensions for new [**molded brick shapes] [and] [brick arches**] and their jointing, showing relationship of existing units to new units.

Show provisions for expansion joints or other sealant joints.

Show provisions for flashing, lighting fixtures, conduits, and weep holes as required.

Show replacement and repair anchors. Include details of anchors within individual bricks, with locations of anchors and dimensions of holes and recesses in units required for anchors.

Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

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

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

Retain and revise subparagraphs below, and insert others to suit Project. Brick samples are not included below, because the existing brick is typically the standard of appearance; however, brick samples for selection could be inserted. Revise optional joint width in "Colored Mortar" Subparagraph below to approximate existing joint widths.

Colored Mortar: Submit sets of mortar that will be left exposed in the form of sample mortar strips, 6 inches long by [**1/4 inch] [1/2 inch**] wide, set in aluminum or plastic channels.

Have each set contain a close color range of at least [**three] [six] <Insert number**> Samples of different mixes of colored sands and cements that produce a mortar matching existing, cleaned mortar when cured and dry.

Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.

Sand Types Used for Mortar: Minimum 8 oz. of each in plastic screw-top jars.

For blended sands, provide Samples of each component and blend. Identify blend ratio.

Identify sources, both supplier and quarry, of each type of sand.

Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.

Have each set contain a close color range of at least [**three] [six] <Insert number**> Samples of different mixes of patching compound that match the variations in existing masonry when cured and dry.

Include similar Samples of accessories involving color selection.

* + - * 1. Samples for Verification: For the following:

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

Each type of brick to be used for replacing existing units. Include sets of Samples to show the full range of shape, color, and texture to be expected.

For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.

Samples in first subparagraph below are of limited value, because they are not cured under same conditions as patching compound used in actual work. A mockup provides a better sample.

Each type of patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.

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

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

Consider "Qualification Data," "Quality-control program," and "Unit masonry historic treatment program" paragraphs below as they relate to Project goals and importance.

* + - * 1. Qualification Data: For [**historic treatment specialist] [including field supervisors and workers] [and] [testing service**].

Retain "Preconstruction Test Reports" Paragraph below if specifying preconstruction testing in "Preconstruction Testing" Article as Contractor's responsibility.

* + - * 1. Preconstruction Test Reports: For [**existing bricks and mortar] [and] [replacement bricks**].

Retain one of or both paragraphs below if retaining programs in "Quality Assurance" Article.

* + - * 1. Quality-control program.
				2. Unit masonry historic treatment program.
			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 brick masonry repair specialist. Experience installing standard unit masonry is insufficient experience for masonry historic treatment work.

Retain "Historic Treatment Worker Qualifications" Subparagraph below if required; option is an example only.

Historic Treatment Worker Qualifications: [**When bricks are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products] <Insert requirement**>.

* + - * 1. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising worker performance and preventing damage.
				2. Unit Masonry Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of historic treatment work, including protection of surrounding materials and Project site.

Retain first subparagraph below if high-lime-content mortar is used.

Include methods for keeping exposed mortar damp during curing period.

If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program 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.

* + - * 1. Mockups: Prepare mockups of historic treatment to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.

Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches in least dimension. Construct sample areas in locations in existing walls where directed by Director’s Representative unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:

Replacement: [**Four] <Insert number**> brick units replaced.

Reanchoring Veneers: Install three masonry repair anchors in mockup wall assembly of each anchor type required.

Patching: Three small holes [**at least 1 inch in diameter] [as directed] <Insert** size> for each type of brick indicated to be patched, so as to leave no evidence of repair.

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. PRECONSTRUCTION TESTING

Retain this article for preconstruction testing. Revise this article based on Director’s Representative's knowledge of the building's materials and experience with similar work. Project-specific preconstruction testing can be expensive but may be the best means of proving that performance requirements are met.

* + - * 1. Preconstruction Testing Service: [**Director’s Representative will engage] [Engage**] a qualified testing agency to perform preconstruction testing on brick masonry as follows:

Retain applicable subparagraphs below; revise tests and insert others if required.

Provide test specimens as indicated and representative of proposed materials and existing construction.

Replacement Brick: Test each proposed type of replacement brick, according to sampling and testing methods in ASTM C67 for compressive strength, 24-hour cold-water absorption, five-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).

Usually test existing brick and mortar before preparing the Specifications, and delete "Existing Brick," "Existing Mortar," and "Temporary Patch" subparagraphs below.

Existing Brick: Test each type of existing brick indicated for replacement, according to testing methods in ASTM C67 for compressive strength, 24-hour cold-water absorption, five-hour boil absorption, saturation coefficient, and initial rate of absorption (suction). Carefully remove [**five] <Insert number**> existing units for testing from locations designated by Director’s Representative. Take testing samples from these units.

Existing Mortar: Test according to ASTM C1324, modified as agreed by testing service and Director’s Representative for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength. Use X-ray diffraction, infrared spectroscopy, and differential thermal analysis to supplement microscopical methods. Carefully remove existing mortar for testing from within joints at [**five] <Insert number**> locations designated by [**Director’s Representative] [or] [testing service**].

Temporary Patch: As directed by Director’s Representative, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

* + - 1. DELIVERY, STORAGE, AND HANDLING

Retain paragraphs below that are applicable to products retained in Part 2.

* + - * 1. Deliver bricks to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.
				2. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
				3. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
				4. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
				5. Store lime putty covered with water in sealed containers.
				6. Store sand where grading and other required characteristics can be maintained and contamination avoided.
				7. Handle bricks to prevent overstressing, chipping, defacement, and other damage.
			1. FIELD CONDITIONS

Usually retain this article; revise to suit Project.

* + - * 1. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repair work to be performed according to product manufacturers' written instructions and specified requirements.

Retain "Temperature Limits" or "Cold-Weather Requirements" Paragraph below. Retain second if cold-weather construction is permitted for repair work.

* + - * 1. Temperature Limits: Repair brick masonry only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.
				2. Cold-Weather Requirements: Comply with the following procedures for masonry repair unless otherwise indicated:

When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.

When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.

* + - * 1. Hot-Weather Requirements: Protect masonry repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.
				2. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

If required, insert "Extra Materials" Article for extra materials that match products applied or installed.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS
				1. Source Limitations: Obtain each type of material for repairing historic masonry (face brick, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.
			2. DIRECTOR’S REPRESENTATIVE-FURNISHED MATERIAL

Retain this article if salvaged brick is available from Director’s Representative for reuse; revise to suit Project.

* + - * 1. Salvaged brick.
			1. MASONRY MATERIALS

Revise this article to suit Project. Insert other materials and properties if required.

* + - * 1. Face Brick: Units, including molded, ground, cut, or sawed shapes as required to complete masonry repair work.

Retain "Brick Matching Existing" or "Brick Matching Sample" Subparagraph below.

Retain first option in "Brick Matching Existing" Subparagraph below, revising percentage if required, if properties are unknown. Retain second option if required properties are known.

Brick Matching Existing: Units with colors, color variation within units, surface texture, size, and shape that match existing brickwork and with physical properties [**within 10 percent of those determined from preconstruction testing of selected existing units.] [as listed below:]**

Retain "Physical Properties" Subparagraph below if required properties are known.

Physical Properties: According to ASTM C67 and as follows:

Compressive Strength: <**Insert requirement**>.

24-Hour Cold-Water Submersion Absorption: <**Insert requirement**>.

Five-Hour Boil Absorption: <**Insert requirement**>.

Saturation Coefficient: <**Insert requirement**>.

Initial Rate of Absorption: <**Insert requirement**>.

For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

Brick Matching Sample: Units with colors, color variation within units, surface texture, and physical properties that match sample. Match existing units in size and shape.

Retain "Physical Properties" Subparagraph below if required properties are known.

Physical Properties: According to ASTM C67 and as follows:

Compressive Strength: <**Insert requirement**>.

24-Hour Cold-Water Submersion Absorption: <**Insert requirement**>.

Five-Hour Boil Absorption: <**Insert requirement**>.

Saturation Coefficient: <**Insert requirement**>.

Initial Rate of Absorption: <**Insert requirement**>.

For Sample that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range rather than brick that matches an individual color within that range.

Special Shapes:

Provide molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position, and where shapes produced by sawing would result in sawed surfaces being exposed to view.

Provide specially ground units, shaped to match patterns, for arches and where indicated.

Mechanically chopping or breaking brick, or bonding pieces of brick together by adhesive, are unacceptable procedures for fabricating special shapes.

Tolerances as Fabricated: [**According to tolerance requirements in ASTM C216, Type FBX] [According to tolerance requirements in ASTM C216, Type FBS] <Insert requirement**>.

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

Date Identification: Emboss in the clay body on a concealed, interior surface of each unit in easily read 1/2-inch high characters, "MADE <**Insert year**>." Manufacturer's name may also be embossed.

Retain "Building Brick" Paragraph below if rebuilding brick backup wythes is required. Revise paragraph if other types of backup masonry are required.

* + - * 1. Building Brick: ASTM C62, of same vertical dimension as face brick, for masonry work concealed from view.

Retain one of or both of first two subparagraphs below to suit Project.

Grade SW where in contact with earth.

Generally, retain first option in first subparagraph below for exterior walls; retain second option for interior walls; revise to suit Project.

[**Grade SW or Grade MW] [Grade SW, Grade MW, or Grade NW**] for concealed backup.

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

Date Identification: Emboss in the clay body on a concealed, interior surface of each unit in easily read 1/2-inch high characters, "MADE <**Insert year**>." Manufacturer's name may also be embossed.

Retain "Salvaged Brick" Paragraph below if salvaged brick is available for reuse. Indicate on Drawings where salvaged brick is stored.

* + - * 1. Salvaged Brick: Obtain salvaged brick from location indicated on Drawings. Clean off residual mortar.

Insert a paragraph here to specify reclaimed brick from offsite sources if known.

* + - 1. MORTAR MATERIALS

In "Portland Cement" Paragraph below, gray portland cement is sometimes used to help obtain correct mortar color.

* + - * 1. Portland Cement: ASTM C150, Type I or Type II; white[ **or gray or both**] where required for color matching of mortar.

Retain subparagraph below if required.

Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

Usually, retain "Hydrated Lime" Paragraph and delete "Factory-Prepared Lime Putty" and "Quicklime" paragraphs below. If hydrated lime is not required, usually retain "Factory-Prepared Lime Putty" Paragraph and delete "Quicklime" Paragraph to ensure that lime is properly slaked. Quicklime must be slaked (a lengthy, separate process) before it is used. If retaining "Factory-Prepared Lime Putty" Paragraph, delete "Preparing Lime Putty" Paragraph in "Mortar Mixes" Article.

* + - * 1. Hydrated Lime: ASTM C207, Type S.
				2. Factory-Prepared Lime Putty: ASTM C1489.
				3. Quicklime: ASTM C5, pulverized lime.
				4. Mortar Sand: ASTM C144 unless otherwise indicated.

Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

Retain one of or both subparagraphs below to suit Project. Revise "Colored Mortar" Subparagraph below to produce mortar quality and appearance required for Project.

Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

Retain subparagraph below if required.

For exposed mortar, provide sand with rounded edges.

If known, indicate source of sand and size and gradation. Insert requirements for other special aggregates, such as seashell fragments, if any.

Retain "Mortar Pigments" Paragraph below if pigmented mortar is permitted.

* + - * 1. Mortar Pigments: ASTM C979, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
				2. Water: ASTM C270, potable.
			1. MANUFACTURED REPAIR MATERIALS
				1. Brick Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching brick masonry.

Use formulation that is vapor and water permeable (equal to or more than the brick), exhibits low shrinkage, has lower modulus of elasticity than the bricks being repaired, and develops high bond strength to all types of masonry.

Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.

Formulate patching compound used for patching brick in colors and textures to match each unit being patched. Provide [**sufficient number of] [not less than three] <Insert number**> colors to enable matching the color, texture, and variation of each unit.

* + - 1. ACCESSORY MATERIALS

Revise three anchor paragraphs below if types other than stainless steel are required. Type 304 stainless steel is typical, but some jurisdictions or conditions may require Type 316. Firms often indicate type on Drawings.

In "Masonry Repair Anchors, Expansion Type" Paragraph below, verify availability with manufacturers if specifying Type 316 stainless steel.

* + - * 1. Masonry Repair Anchors, Expansion Type: Mechanical fasteners designed for masonry veneer stabilization consisting of 1/4-inch diameter, [**Type 304] [Type 316**] stainless-steel rod with brass expanding shells at each end and water-shedding washer in the middle. Expanding shells shall be designed to provide positive mechanical anchorage to veneer on one end and backup masonry on the other.

In "Masonry Repair Anchors, Spiral Type" Paragraph below, verify availability with manufacturers if specifying Type 316 stainless steel.

* + - * 1. Masonry Repair Anchors, Spiral Type: Driven-in, [**Type 304] [Type 316**] stainless-steel spiral rods designed to be installed in drilled holes and relying on screw effect rather than adhesive to secure them to backup and veneer. Anchors are flexible in plane of veneer but rigid perpendicular to it.

Revise "Masonry Repair Anchors, Expanding Grout Sleeve Type" Paragraph below if inserting systems by other manufacturers.

* + - * 1. Masonry Repair Anchors, Expanding Grout Sleeve Type: Fabric sleeve system with Type 304 stainless-steel tube through which system manufacturer's grout is pumped to expand the sleeve, fill cavities within wall, and bond mechanically and chemically with interior of wall construction; and complete with other devices required for installation.

Retain "Setting Buttons and Shims" Paragraph below to ensure equal joint spacing.

* + - * 1. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of bricks, less the required depth of pointing materials unless removed before pointing.
				2. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

Insert paragraph(s) for other types of masking products, including tapes, sheets, etc., to suit Project.

Retain "Antirust Coating" Paragraph below if retaining requirement in Part 3 for coating existing anchors within wall.

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

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

VOC Limit: Use coating with a VOC content of [**3.3 lb/gal**] or less.

* + - * 1. 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.

Minimal 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 harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in Contract.

Leave residue on surfaces.

* + - 1. MORTAR MIXES

Retain "Preparing Lime Putty" Paragraph below unless hydrated lime or factory-prepared lime putty is used.

* + - * 1. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C5 and manufacturer's written instructions.
				2. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
				3. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Director’s Representative's approval.

Retain "Mortar Pigments" Subparagraph below if using pigments; revise to suit Project.

Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

* + - * 1. Do not use admixtures in mortar unless otherwise indicated.
				2. Mixes: Mix mortar materials in the following proportions:

Retain "Rebuilding (Setting) Mortar by Volume," "Rebuilding (Setting) Mortar by Type," "Rebuilding (Setting) Mortar by Property," or "Rebuilding (Setting) Mortar by ASTM C1713 Composition" Subparagraph below, or revise to indicate specific requirements for each type of brick unit indicated. Consider revising portland cement to white portland cement if exposed, light-colored mortar is required.

Volumetric proportions in "Rebuilding (Setting) Mortar by Volume" Subparagraph below are examples only; revise to suit Project.

Rebuilding (Setting) Mortar by Volume: ASTM C270, Proportion Specification, [**1 part portland cement, 2 parts lime, and 7 parts sand] [1 part portland cement, 4 parts lime, and 12 parts sand] <Insert proportions**>.

Rebuilding (Setting) Mortar by Type: ASTM C270, Proportion Specification, [**Type N] [Type O] <Insert type**> unless otherwise indicated; with cementitious material limited to portland cement and lime.

Insert additional properties in "Rebuilding (Setting) Mortar by Property" Subparagraph below if required.

Rebuilding (Setting) Mortar by Property: ASTM C270, Property Specification, [**Type N] [Type O] <Insert type**> unless otherwise indicated; with cementitious material limited to portland cement and lime.

"Rebuilding (Setting) Mortar by ASTM C1713 Composition" Subparagraph below is based on proportion specification of ASTM C1713; revise if property specification is required. Volumetric proportion is an example only; revise to suit Project. See the Evaluations for discussion of ASTM C1713.

Rebuilding (Setting) Mortar by ASTM C1713 Composition: ASTM C1713, with binder material limited to [**portland cement and lime] <Insert binder(s)**>, and with a volume ratio of [**1 part portland cement, 1 part lime, and 6 parts sand] <Insert proportions**>.

Retain "Colored Mortar" Subparagraph below if adding mortar pigment to setting-mortar mix in order to set and point masonry with rebuilding (setting) mortar.

Colored Mortar: Add mortar pigments to produce exposed, setting (rebuilding) mortar of colors required.

1. EXECUTION
	* + 1. HISTORIC TREATMENT SPECIALIST

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

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

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

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

* + - 1. PROTECTION
				1. Prevent mortar from staining face of surrounding masonry and other surfaces.

Cover sills, ledges, and other projecting items to protect them from mortar droppings.

Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.

Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

Retain paragraph below if applicable; insert other items that may interfere with execution of repair work.

* + - * 1. Remove[ **gutters and**] downspouts and associated hardware adjacent to immediate work area, and store during masonry repair work. Reinstall when repairs are complete.

Provide temporary rain drainage during work to direct water away from building.

* + - 1. MASONRY REPAIR, GENERAL
				1. Have repair work performed only by qualified historic treatment specialist.

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] [50**] feet away by Director’s Representative.
			1. ABANDONED ANCHOR REMOVAL <**Insert drawing designation**>

Copy this article and re-edit for significantly different conditions and anchor types to be removed.

Insert drawing designation. Use these designations on Drawings to identify locations. See "Delineating the Work" Article in the Evaluations for discussion of these designations.

* + - * 1. Remove abandoned anchors, brackets, wood nailers, and other extraneous items [**no longer in use unless indicated to remain] [indicated to be removed**].

Remove items carefully to avoid spalling or cracking masonry.

Notify Director’s Representative before proceeding if an item cannot be removed without damaging surrounding masonry. Do the following where directed:

Revise first two subparagraphs below if cutting off an item flush is acceptable. Ferrous items continue to corrode if cut off flush.

Cut or grind off item approximately [**3/4 inch**] beneath surface, and core drill a recess of same depth in surrounding masonry as close around item as practicable.

Immediately paint exposed end of item with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.

Patch the hole where each item was removed unless directed to remove and replace brick.

* + - 1. BRICK REMOVAL AND REPLACEMENT <**Insert drawing designation**>

Copy this article and re-edit for significantly different shapes and sizes of bricks to be removed and replaced.

Insert drawing designation. Use these designations on Drawings to identify locations. See "Delineating the Work" Article in the Evaluations for discussion of these designations.

* + - * 1. At locations indicated, remove bricks that are damaged, spalled, or deteriorated[ **or are to be reused**]. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

When removing single bricks, remove material from center of brick and work toward outside edges.

* + - * 1. Support and protect remaining masonry that surrounds removal area.

Retain option in first paragraph below if applicable; revise to suit Project.

* + - * 1. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.[ **Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.]**
				2. Notify Director’s Representative of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units in existing backup, rotted wood, rusted metal, and other deteriorated items.
				3. Remove in an undamaged condition as many whole bricks as possible.

Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.

Remove sealants by cutting close to brick with utility knife and cleaning with solvents.

Store brick for reuse. Store off ground, on skids, and protected from weather.

Deliver cleaned brick not required for reuse to Director’s Representative unless otherwise indicated.

* + - * 1. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.

Retain first option in first paragraph below if salvaged brick is available; retain second option if new brick is acceptable.

* + - * 1. Replace removed damaged brick with other removed brick[ **and salvaged brick**] in good condition, where possible, [**or] [with new brick** ]matching existing brick. Do not use broken units unless they can be cut to usable size.
				2. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

Maintain joint width for replacement units to match existing joints.

Retain subparagraph below especially for narrow joints and where multiple courses are laid in quick succession.

Use setting buttons or shims to set units accurately spaced with uniform joints.

* + - * 1. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

Retain one of first two subparagraphs below. Coordinate with mortar mixes in Part 2. First paragraph assumes that laying, setting, and repointing are done at same time; second assumes that joints are repointed separately.

Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.

Rake out mortar used for laying brick before mortar sets according to Section 040323 "Historic Brick Unit Masonry Repointing." Point at same time as repointing of surrounding area.

When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.

Retain "Curing" Paragraph below for all mortars. Proper moist curing is critical for high-lime-content mortars.

* + - * 1. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

Revise subparagraph below to suit Project.

Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

* + - 1. BACKUP MASONRY REMOVAL AND REPLACEMENT <**Insert drawing designation**>

This article assumes that there is brick backup masonry. Copy this article and re-edit for significantly different shapes, sizes, and types of backup masonry to be removed and replaced.

Insert drawing designation. Use these designations on Drawings to identify locations of backup replacement where known. See "Delineating the Work" Article in the Evaluations for discussion of these designations.

* + - * 1. Where backup masonry is fractured or unstable and at locations indicated, remove mortar and masonry units that are broken or deteriorated and rebuild with whole, new brick or whole salvaged backup masonry units. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
				2. Support and protect remaining masonry that surrounds removal area.

Retain option in first paragraph below if applicable; revise to suit Project.

* + - * 1. Maintain flashing, reinforcement, anchors, lintels, and adjoining construction in an undamaged condition.[ **Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.**]
				2. Notify Director’s Representative of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units beyond the removal area, rotted wood, rusted metal, and other deteriorated items.
				3. Remove in an undamaged condition as many whole bricks as possible.

Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.

Remove sealants by cutting close to brick with utility knife and cleaning with solvents.

Store brick for reuse. Store off ground, on skids, and protected from weather.

Deliver cleaned brick not required for reuse to Director’s Representative unless otherwise indicated.

* + - * 1. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.
				2. Replace removed damaged brick with salvaged backup brick in good condition, where possible, or with new building brick matching existing backup brick. Do not use broken units unless they can be cut to usable size.
				3. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
				4. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

Retain "Curing" Paragraph below for all mortars. Proper moist curing is critical for high-lime-content mortars.

* + - * 1. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

Revise subparagraph below to suit Project.

Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

* + - 1. REANCHORING VENEERS <**Insert drawing designation**>

Copy this article and re-edit for significantly different types of veneer reanchoring.

Insert drawing designation. Use these designations on Drawings to identify locations. See "Delineating the Work" Article in the Evaluations for discussion of these designations.

Consult Project structural Director’s Representative about anchor-spacing requirement in first paragraph below; revise to suit Project.

* + - * 1. Install masonry repair anchors in horizontal mortar joints and according to manufacturer's written instructions. Space anchors not more than [**16 inches o.c. vertically and 24 inches o.c. horizontally]** apart unless otherwise indicated. Install at locations to avoid penetrating flashing.
				2. Recess anchors 5/8 inch or more from surface of mortar joint, and fill recess with pointing mortar according to Section 040323 "Historic Brick Unit Masonry Repointing."
			1. PAINTING STEEL UNCOVERED DURING THE WORK <**Insert drawing designation**>

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

Insert drawing designation. Use these designations on Drawings to identify locations. See "Delineating the Work" Article in the Evaluations for discussion of these designations.

* + - * 1. Notify Director’s Representative if steel is exposed during masonry removal. Where Director’s Representative determines that 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 retained in "Accessory 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 dimension of acceptable steel loss 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. BRICK MASONRY PATCHING <**Insert drawing designation**>

Copy this article and re-edit for significantly different types and sizes of brick masonry patching.

Insert drawing designation. Use these designations on Drawings to identify locations. See "Delineating the Work" Article in the Evaluations for discussion of these designations.

Patching slightly to moderately damaged brick masonry is usually much less expensive than replacement. For historic treatment projects, it is also important to retain as much of original fabric of building as possible.

* + - * 1. Patch the following bricks unless another type of repair or replacement is indicated:

Usually, retain first subparagraph below and indicate units that require patching on Drawings.

Units indicated to be patched.

Retain three subparagraphs below with or without subparagraph above; revise to suit Project.

Units with holes.

Consider retaining option in one of or both subparagraphs below to define an acceptable defect size; revise to suit Project.

Units with chipped edges or corners.[ **Patch chipped edges or corners measuring more than 3/4 inch in least dimension**.]

Units with small areas of deep deterioration.[ **Patch deep deteriorations measuring more than 3/4 inch in least dimension and more than 1/4 inch deep**.]

Retain first paragraph below if there are existing patches in unsatisfactory condition. Retain one of two options; retain first if not all existing patches require replacement and their locations are indicated on Drawings; revise to suit Project.

* + - * 1. Remove and replace existing patches [**where indicated] [unless otherwise indicated or approved by Director’s Representative**].
				2. Patching Bricks:

Remove loose material from masonry surface. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least [**1/4 inch**] thick, but not less than recommended in writing by patching compound manufacturer.

Mask adjacent mortar joint or rake out for repointing if patch extends to edge of brick.

Retain first subparagraph below for bricks that exhibit a color variation.

Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.

Rinse surface to be patched and leave damp, but without standing water.

Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.

Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.

Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the brick. Shape and finish surface before or after curing, as determined by testing, to best match existing brick.

Keep each layer damp for 72 hours or until patching compound has set.

* + - 1. FINAL CLEANING

Retain this article only if overall cleaning of existing masonry occurs before repair work is completed.

Revise first paragraph below if chemical cleaning of rebuilt or repointed masonry is required; delete if overall cleaning of repaired historic masonry is included in another Section.

* + - * 1. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.

Do not use metal scrapers or brushes.

Do not use acidic or alkaline cleaners.

Paragraphs below are examples only; revise to suit Project.

* + - * 1. Clean adjacent nonmasonry surfaces. Use detergent and soft brushes or cloths.
				2. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
				3. Remove masking materials, leaving no residues that could trap dirt.
			1. FIELD QUALITY CONTROL

Retain "Testing Agency" Paragraph if Director’s Representative retains full-time inspectors or "Architect's Project Representatives" Paragraph below if Architect's representatives will be on-site daily to make observations, or both.

* + - * 1. Testing Agency: Director’s Representative will engage qualified testing agencies to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
				2. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.
				3. Notify [**testing agency] [and] [Architect's Project representatives**] in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until [**inspectors] [and] [Architect's Project representatives**] have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.
			1. MASONRY-WASTE DISPOSAL
				1. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property.
				2. Masonry Waste: Remove masonry waste and legally dispose of off State property.

END OF SECTION 040322