SECTION 040343 - HISTORIC STONE MASONRY REPOINTING

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 repointing stone masonry joints with [**mortar] [and] [sealant**].
          2. 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 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 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 repointing historic masonry 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 repointing work under quantity allowances and only as authorized. Authorized work includes[ **work required by Drawings and Specifications and**] work as directed in writing by Director’s Representative.

Retain first subparagraph below to suit Project.

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

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

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. Repointing stonework is part of repointing historic masonry 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**].

* + - * 1. Rift: The most pronounced direction of splitting or cleavage of a stone. Rift may be obscure in igneous rocks such as granite. Often it is obvious, as with bedding planes in many sedimentary stones.
      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 on historic masonry repair and repointing 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 repointing.

Review methods and procedures related to repointing historic stone masonry including, but not limited to, the following:

Verify 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.

Stone 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 pointing 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. Below assumes that cleaning, if required, precedes repointing. For this, masonry and joints must be sound enough to prevent water and chemicals from penetrating into building.

* + - * 1. Work Sequence: Perform stone 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 for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.

Remove paint.

Clean stone.

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

Repair stonework, including replacing existing stone with new stone.

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 stonework, delay application of these chemicals until after pointing and cleaning.

If required, insert a subparagraph in the sequence for stone consolidation treatment. Some stone consolidation treatments, particularly those with water repellent, must be scheduled after all repair and pointing work is completed, because mortar and sealants do not adhere to them.

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

Retain paragraph below if scaffolding anchor holes in stonework 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 stone according to Section 040342 "Historic Stone Masonry Repair." Patch holes in mortar joints according to Part 3 "Repointing" Article.
      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 repointing work on the structure.

Show provisions for expansion joints or other sealant joints.

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. Revise optional joint width in "Pointing Mortar" Subparagraph to approximate existing joint widths.

Pointing Mortar: Submit sets of mortar for pointing 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.

Each type of sand used for pointing 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.

Sealant materials.

Include similar Samples of accessories involving color selection.

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

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

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

Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by [**1/4 inch] [1/2 inch**] wide, set in aluminum or plastic channels.

Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.

Sealant materials.

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

Consider "Qualification Data," "Quality-control program," and "Stone 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 stone types and mortar.

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

* + - * 1. Quality-control program.
        2. Stone 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 masonry repointing specialist. Experience in pointing or repointing only new or nonhistoric masonry is insufficient experience for masonry historic treatment work.
        2. 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.
        3. Stone Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of the 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 pointing 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. Generally, retain option below, because separate mockups may not adequately show blending of new work with existing construction.

* + - * 1. Mockups: Prepare mockups of historic treatment[ **on existing surfaces**] to demonstrate aesthetic effects and to set quality standards for materials and execution.

Repointing: Rake out joints in two separate areas[,**each approximately 36 inches high by 48 inches wide**] [as indicated] for each type of repointing required, and repoint one of the areas.

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

* + - 1. PRECONSTRUCTION TESTING

Retain this article for preconstruction testing. Revise article based on the Designer's knowledge of the building's materials and experience with similar work. Some preconstruction testing results from Section 040342 "Historic Stone Masonry Repair" may also be used. If no masonry repairs other than repointing are required, the taking of samples of existing stone according to "Existing Stone" Subparagraph below may be unacceptable.

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

Usually test existing stone and mortar before preparing the Specifications, and delete "Existing Stone," "Existing Mortar," and "Temporary Patch" subparagraphs below. Delete whole "Preconstruction Testing" article if deleting these subparagraphs and not inserting other subparagraphs.

Existing Stone: Test each type of existing stone indicated for repointing, according to ASTM C170 for compressive strength, wet and dry, perpendicular and parallel to rift. Carefully remove [**three] <Insert number**> existing stones for testing from locations designated by Director’s Representative. Take testing samples from these stones.

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 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 packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
        2. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
        3. 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.
        4. Store lime putty covered with water in sealed containers.
        5. Store sand where grading and other required characteristics can be maintained and contamination avoided.
      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 repointing work to be performed according to product manufacturers' written instructions and specified requirements.

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

* + - * 1. Temperature Limits: Repoint mortar joints 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 mortar-joint pointing unless otherwise indicated:

When air temperature is below 40 deg F, heat mortar ingredients and existing stone 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 pointing.

* + - * 1. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar 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.

1. PRODUCTS
   * + 1. PERFORMANCE REQUIREMENTS
          1. Source Limitations: Obtain each type of material for repointing historic masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.
       2. 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, also 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.

Revise "Color" Subparagraph below to produce mortar quality and appearance required for Project.

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

Retain subparagraph below if required.

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. ACCESSORY MATERIALS

Retain "Sealant Materials" and "Joint-Sealant Backing" paragraphs below if sealant joints are required unless all sealant work, including sealant within masonry repairs, is specified in Section 079200 "Joint Sealants."

* + - * 1. Sealant Materials:

Sealant manufacturer's standard elastomeric sealant(s) of base polymer and characteristics indicated below and according to applicable requirements in Section 079200 "Joint Sealants."

Retain and coordinate type(s) of joint sealant required in "Type" Subparagraph below with applicable subparagraph titles used in Section 079200 "Joint Sealants" in which various sealant types are specified. Revise sealant type to suit Project.

Type: [**Single-component, nonsag urethane sealant] <Insert type**>.

Colors: Provide colors of exposed sealants to match colors of mortar adjoining installed sealant unless otherwise indicated.

Retain "Ground-Mortar Aggregate" Subparagraph below if retaining requirement in Part 3 for dressing exposed sealant joints with ground-mortar aggregate.

Ground-Mortar Aggregate: Custom crushed and ground pointing mortar sand or existing mortar retrieved from joints. Grind to a particle size that matches the adjacent mortar aggregate and color. Remove all fines passing the [**100] <Insert number**> sieve.

In "Joint-Sealant Backing" Paragraph below, verify with joint-sealant manufacturers the suitability of each material for sealant retained. See the Evaluations in Section 079200 "Joint Sealants."

* + - * 1. Joint-Sealant Backing:

Cylindrical Sealant Backings: ASTM C1330, [**Type C (closed-cell material with a surface skin)] [or] [Type B (bicellular material with a surface skin**)], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended in writing by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

Insert other joint materials, such as lead wool or lead T-cap, if acceptable and required.

* + - * 1. 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.

* + - * 1. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

Previous effectiveness in performing 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 in ASTM C5 and to 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.

Retain "Mixing Pointing Mortar" Subparagraph below if mortar prehydration is required.

Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

* + - * 1. 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. Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.

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

Retain "Pointing Mortar by Volume," "Pointing Mortar by Type," "Pointing Mortar by Property," or "Pointing Mortar by ASTM C1713 Composition" Subparagraph below, or revise to indicate specific requirements for each type of stone unit indicated. Consider revising portland cement to white portland cement if light-colored mortar is required. Retain last option in retained subparagraph if pigments are used.

The volumetric proportions in "Pointing Mortar by Volume" Subparagraph below are examples only; revise to suit Project.

Pointing 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>.[ Add mortar pigments to produce mortar colors required**.]

Pointing 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.[ **Add mortar pigments to produce mortar colors required**.]

Insert additional properties in "Pointing Mortar by Property" Subparagraph below if required.

Pointing 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.[ **Add mortar pigments to produce mortar colors required**.]

"Pointing Mortar by ASTM C1713 Composition" Subparagraph below is based on proportion specification of ASTM C1713; revise if property specification is required. The volumetric proportion is an example only; revise to suit Project. See the Evaluations for discussion of ASTM C1713.

Pointing 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>.[ Add mortar pigments to produce mortar 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 Document 002213 "Supplementary Instructions to Bidders."

* + - * 1. Historic Treatment Specialist Firms: Subject to compliance with requirements, [**provide historic masonry repointing by one of the following] [firms that may provide historic masonry repointing 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 stone and other surfaces.

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

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

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

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

* + - * 1. Remove[ **gutters and**] downspouts and associated hardware adjacent to immediate work area and store during stone repointing work. Reinstall when repointing is complete.

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

* + - 1. STONE REPOINTING, GENERAL
         1. Have repointing work performed only by qualified historic treatment specialist.

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

* + - * 1. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from [**20**] [**50**] feet away by Director’s Representative.

Insert an article here for widening specific, extremely narrow or abutting joints, if required. See "Repointing Masonry" Article in the Evaluations.

* + - 1. REPOINTING <**Insert drawing designation**>

Copy this article and re-edit for significantly different types and sizes of joints to be repointed.

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. Rake out and repoint joints to the following extent:

Retain first subparagraph below if complete repointing of selected areas is indicated on Drawings. The U.S. Department of the Interior's "The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings" prohibits removing sound mortar and replacing it solely to achieve uniform appearance.

All joints in areas indicated.

Joints indicated as sealant-filled joints.

Retain subparagraph below if spot repointing of missing and deteriorated joints is required.

Joints at locations of the following defects:

Holes and missing mortar.

Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.

Cracks [1/16] [1/8] inch or more in width and of any depth.

Hollow-sounding joints when tapped by metal object.

Eroded surfaces 1/4 inch or more deep.

Deterioration to point that mortar can be easily removed by hand, without tools.

Joints filled with substances other than mortar.

* + - * 1. Do not rake out and repoint joints where not required.
        2. Rake out joints as follows, according to procedures demonstrated in approved mockup:

Revise first subparagraph below according to depth required to rake out joints for Project. See the Evaluations.

Remove mortar from joints to depth of [**joint width plus 1/8 inch] [2 times the joint width] [2-1/2 times the joint width] [not less than 1/2 inch] [not less than 3/4 inch] [and] [not less than that required to expose sound, unweathered mortar**]. Do not remove unsound mortar more than [2 inches] deep; consult Director’s Representative for direction.

Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.

Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Director’s Representative.

Retain one of two subparagraphs below; revise to suit Project.

Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Director’s Representative's written approval based on approved quality-control program.

Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar in bed joints and mortar in head joints by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

* + - * 1. Notify Director’s Representative of unforeseen detrimental conditions, including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.
        2. Pointing with Mortar:

Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.

Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than [**3/8 inch**] until a uniform depth is formed. Fully compact each layer thoroughly, and allow it to become thumbprint hard before applying next layer.

After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than [**3/8 inch**]. Fully compact each layer, and allow it to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to featheredge the mortar.

When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.

Retain first subparagraph below for all mortars. Proper moist curing is critical for high-lime-content mortars.

Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

First two subparagraphs below may be deleted for mortars with high portland cement content.

Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.

Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

Revise subparagraph below to suit Project.

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

Retain "Pointing with Sealant" Paragraph below if sealant joints are required unless all sealant work, including joints repointed with sealant, is specified in Section 079200 "Joint Sealants."

* + - * 1. Pointing with Sealant: Comply with Section 079200 "Joint Sealants" and as follows:

After raking out, keep joints dry and free of mortar and debris.

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

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

Fill sealant joints with specified joint sealant.

Install cylindrical sealant backing beneath the sealant. Where space is insufficient for cylindrical sealant backing, install bond-breaker tape.

Install sealant using only proven installation techniques that ensure that sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding stonework and matching the contour of adjoining mortar joints.

Install sealant as recommended in writing by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:

Fill joints to a depth equal to joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

Tool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant from surfaces adjacent to joint.

Retain "Sanded Joints" Subparagraph below to dull the surface of sealant and blend it better with mortar joints. Sealant manufacturers generally do not recommend this procedure, because their sealants are not performance tested with this treatment.

Sanded Joints: Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Lightly retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate from surfaces adjacent to joint.

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

* + - * 1. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days before beginning cleaning work.

Insert installation of other joint-pointing materials, such as lead wool or lead T-cap, if acceptable and required.

* + - 1. FINAL CLEANING

Retain this article only if overall cleaning of existing stonework occurs before pointing work is completed.

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

* + - * 1. After mortar has fully hardened, thoroughly clean exposed stone 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 nonstone 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 below if Director’s Representative retains full-time inspectors, or retain "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.

END OF SECTION 040343