

SECTION 04901: MASONRY RESTORATION AND REPOINTING

PART 1-GENERAL

1.1 SUMMARY OF WORK

A. Extent of masonry restoration work is as shown on the Drawings and as specified herein.

1. The drawings endeavor to show the extent of masonry restoration work required. The contractor shall review the Drawings, Photographs and make a Pre-bid field visit to verify all work whether shown or not shown on the Drawings.

B. The work includes, but is not limited to: (Examples)

1. Repairing cracks and voids in stone construction.
2. Patching stone structures and stone sills.
3. Repointing mortar joints.
4. Application of water repellent/light consolidant

1.2 QUALITY ASSURANCE

A. Restoration Specialist: Work must be performed by a firm having not less than 5 years successful experience in comparable masonry restoration projects and employing personnel skilled in the restoration process and operations indicated.

1. Only skilled journeymen masons who are familiar and experienced with the materials and methods specified and are familiar with the design requirements shall be used for masonry restoration.

2. One skilled journeyman mason, trained and Certified by the specified stone repair system manufacturer, shall be present at all times during masonry restoration and shall personally direct the work.

B. Field -Construction Mock-ups: Prior to start of general masonry restoration, prepare the following sample panels and sample areas on building where directed by Architect. Obtain Architect's acceptance of visual qualities before proceeding with the work. Retain acceptable panels in undisturbed condition, suitably marked, during restoration as a standard for judging completed work.

1. Coating removal: Demonstrate materials and methods to be used for coating removal for each type of masonry surface and condition with sample panel 4 sq. ft. in area. The removal method or methods shall be tested on an inconspicuous area of the building.

2. Crack Repair: Prepare a sample area for each type of crack repair required for stone. Repair shall demonstrate methods and quality of workmanship expected for crack repair.

3. Patching: Prepare on-building sample of each type of stone and masonry construction to be patched. Patching and mold shall demonstrate methods and quality of workmanship expected of repair work.

3. Repointing: Prepare 2 separate sample areas of approximately 5' high by 5' wide for each type of repointing required, one for demonstrating methods and quality of workmanship expected in removal of mortar from joints and the other for demonstrating quality of materials and workmanship expected in pointing mortar joints. Sample areas shall be located in an inconspicuous yet readily accessible place.

C. Patching, Repointing and Coating work: The samples of each type of repair work shall be done in an area that will be exposed to the same weathering conditions as the building. Allow samples to cure at least three days before obtaining acceptance of color, texture and detailing match. Samples shall be viewed from an approved distance.

D. Source of Materials: Obtain materials for patching, coating, sealing, crack repair and repointing from a single manufacturer source to ensure match quality, color, texture and detailing.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each product specified. Include test data and certifications substantiating that products comply with requirements.

B. Submit the following items in time to prevent delay of the work and to allow adequate time for review and resubmittals, if needed. Do not order materials or start work before receiving the written approval:

1. Written certificates from the patching materials manufacturer should be submitted stating that all installers of the patching material have successfully completed a training workshop for installation of the patching material, or have met alternative workmanship qualifications acceptable to the manufacturer, or provide written certification from the manufacturer that on-site training services have been contracted for.

2. Safety Data Sheets (SDS) as appropriate.

3. Certificates, except where the material is labeled with such certification, by the producers, of the materials, that all materials supplied comply with all the requirements of these specifications and the appropriate standards.

4. Color-match patch samples fabricated on pieces of appropriate masonry from or on the building using the specified repair mortar as required. A minimum of three color shades shall be provided, representing the range of colors present in the existing stonework.

5. Written verification that all specified items will be used. Provided purchase orders, shipping tickets, receipts, etc. to prove that the specified materials were ordered and received.

C. Restoration Program: Submit written program for each phase of restoration process including protection of surrounding material on building and site during operations. Describe in detail material methods and equipment to be used for each phase of restoration work.

D. SUBSTITUTIONS

1. If alternative methods and materials to those indicated are proposed for any phase of restoration work, provide written description, including evidence of at least 10 years' successful use on other, comparable projects, and program of testing to demonstrate effectiveness for use on this project. Provide documentation showing compliance with the requirements for substitutions and the following information:

a. Coordination information, including a list of changes needed to other work that will be necessary to accommodate the substitution.

b. A comparison of the substitution with the specified products and methods, including performance, durability, and visual effect.

c. Product data, including specifications for products and installation procedures.

d. Samples, where applicable, or as requested.

e. A statement indicating the effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the substitution on contract completion time.

f. Cost information, including a proposal of the net change, if any, in the contract sum.

g. Certification that the substitution conforms to the contract documents and is appropriate for the applications indicated. Material substitution requests must be accompanied by independent laboratory test reports from a lab designated by the architect to establish equivalent performance levels and specification compliance. Testing shall be paid for by the submitting party.

h. The Contractor's waiver of rights to additional payment or time that may become necessary because of the failure of the substitution to perform adequately.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site in manufacturer's original unopened containers and packaging, bearing labels as to type and names of products and manufacturers, color numbers and batch numbers.

B. Deliver and store restoration material in manufacturer's original, unopened containers with the grade, batch and production data shown on the container or packaging.

C. Protect restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.

D. Protect grout, mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

F. Comply with the manufacturer's written specifications and recommendations for mixing, application, and curing of grouts and patching materials.

1.5 PROTECTION / SITE CONDITIONS

A. Protect persons, motor vehicles, building site and surrounding buildings from injury resulting from masonry restoration work.

B. Do not perform any masonry patching unless air temperatures are between 50 degrees Fahrenheit (10 deg. C) and 90 degrees Fahrenheit (32 deg. C) and will remain so for at least 48 hours after completion of work.

C. Prevent masonry patching materials from staining the face of masonry or other surfaces to be left exposed. Immediately remove all patching materials that come in contact with such surfaces.

D. Cover partially completed work when work is not in progress.

E. Protect sills, ledges and projections from droppings.

1.6 SEQUENCING / SCHEDULING:

A. Perform masonry restoration work in the following sequence:

1. Repair and/or replace existing roof gutters, flashing, drains and/or leaders as indicated.
2. Remove coatings, stains and foreign material from all stone surfaces.
3. Rake-out existing mortar from joints of masonry indicated to be restored.
4. Repoint existing mortar joints of masonry indicated to be repointed.
5. Pressure-wash building exterior.
6. Patch and repair existing stone structures as indicated.
7. Provide water repellent/consolidant treatment for masonry structures as indicated.

PART 2 – PRODUCTS

2.1 CLEANING MATERIALS:

- A. Cleaning products shall be non-ionic, detergent-based masonry building wash. Material shall be non-corrosive, non-toxic, and water soluble.
- 1. Products: The following shall be assumed to meet the quality and performance requirements specified:
 - a. “E-Wash 30”, by Edison Coatings, Inc., Plainville, CT, (860)-747-2220, or approved equal.

2.2 REPOINTING MORTAR MATERIALS:

A. Repointing mortar shall be a pre-mixed, pre-colored, custom-matched cement-lime based mixture formulated to comply with the requirements of ASTM C-270 Type __ mortar.

- 1. Products: The following shall be assumed to meet the quality and performance requirements specified:
 - a. "SPEC-JOINT 46", by Edison Coatings, Inc., Plainville, CT, (860)747-2220, or approved equal.
 - b. If proposed equal is submitted, thorough lab testing shall be required to establish equivalent performance levels. An independent testing laboratory shall be utilized as determined by the Architect and paid for by the submitting party.

2.3 CRACK INJECTION MATERIALS

A. Cementitious crack filler shall be an ultra-fine, superplasticized, polymer- modified injection grout. Cementitious grout shall be suitable for application in wet or dry cracks, shall develop direct tensile bond strength of 200 psi minimum, shall exhibit less than 0.06% drying shrinkage, and shall have a linear coefficient of thermal expansion of 0.000004 to 0.000008 inches/inch per degree Fahrenheit.

- 1. Products: The following shall be assumed to meet the quality and performance requirements specified:
 - a. PUMP-X 53i, as manufactured by Edison Coatings, Inc., Plainville, CT, Phone (860) 747-2220.

2.4 PATCHING MATERIAL:

A. Patching material shall be a premixed, cementitious material with acrylic latex-modifier, formulated to match the color and texture of the existing stone. Material must be vapor permeable, frost and salt resistant, shall develop direct tensile bond strength of 200 psi minimum, shall exhibit less than 0.06% drying shrinkage, and shall have a linear coefficient of thermal expansion of 0.000005 to 0.000008 inches/inch per degree Fahrenheit. Material shall be compatible with substrate, including but not limited to, porosity, tensile, and compressive strength. Modulus of elasticity shall be 50,000 to 100,000 psi. Non-latex mortars shall be unacceptable. Material shall have a minimum 10-year successful performance history for similar projects.

1. Products: Subject to compliance with requirements, provide the following:

a. "Custom System 45" by Edison Coatings, Inc., Plainville, CT (860) 747-2220.

b. If proposed substitute is submitted, thorough lab testing shall be required to establish equivalent performance levels. An independent testing laboratory shall be utilized as determined by the Architect and paid for by the submitting party.

2.5 REINFORCING MATERIALS

A. Pins / Threaded rods: Type and size are specified herein and as indicated on the Contract Drawings, if not indicated, as per structural engineer's recommendation. Anchors and dowels shall be fabricated from ANSI Type 302/304 stainless steel.

B. Mechanical anchors and dowels (for deep repairs and overhanging repairs): Stainless steel threaded rod (ASTM F-593) with a diameter as indicated on Contract Drawings, bent and cut to lengths required to achieve embedments shown on Contract Drawings. Cut end of rod square.

C. Adhesive: Adhesive shall be a two component epoxy gel, with minimum 4% elongation, 300 psi direct tensile bond strength, 10,000 psi tensile strength. Product shall be applicable to metals, masonry, concrete and other substrates as required, and shall be appropriate for use at ambient temperatures from zero degrees to 100 degrees Fahrenheit (-18 to 38 degrees Celsius).

1. Products: Subject to compliance with requirements, provide the following:

a. FLEXI-WELD 520T, as manufactured by Edison Coatings, Inc., Plainville, CT (860)747-2220.

b. If proposed equal is submitted, thorough lab testing shall be required to establish equivalent performance levels. An independent testing laboratory shall be utilized as determined by the Architect and paid for by the submitting party.

D. Water Repellent/Consolidant: Water repellent/light consolidant shall be a breathable, two-component, proprietary self-crosslinking hybrid system. Product shall be colorless, low viscosity, two component penetrating treatment with minimum 96% moisture vapor transmission per

Oklahoma DOT method, maximum 1% water absorption per Ontario MTC method, and which meets the freeze-thaw requirements of Ontario MTC (50 cycles) and the wind-driven rain resistance requirements of US Federal Specification TT-C-555B. Product shall be non-yellowing and UV resistant for a minimum 1500 hours per ASTM G53-84.

1. Products: Subject to compliance with requirements, provide the following:

a. SYSTEM 90-II, as manufactured by Edison Coatings, Inc., Plainville, CT (860) 747-2220.

PART 3 - EXECUTION

3.1 CLEANING EXISTING MASONRY AND STONE

A. General:

1. Proceed with cleaning in an orderly manner, work from top to bottom of each staging area and from one end of each elevation to the other.

2. Use only those cleaning methods indicated for each masonry material and location.

3. Perform each cleaning method indicated in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.

4. Rinse off chemical residue and soil working upwards from bottom to top of each treated area at each stage or scaffold setting.

3.2 MASONRY REPOINTING

A. Sealant Removal & Stone Repointing

1. Carefully remove existing sealants from stone joints using approved methods. Damage to edges of stone units must be avoided. Remove sealant to its full depth, and rake back existing masonry mortar beneath the sealants to provide a minimum of 3/4" depth for repointing, or until sound mortar is reached, whichever is greater.

2. Wet surfaces to insure that stone is nearly saturated but surface dry when repointed. Completely fill bed, head and collar joints. Maintain joint width to match existing.

3. When mortar is thumbprint hard, tool exposed mortar joints to match joints of original stonework

3.3 LOCATE AND MARK AREA TO BE REPAIRED / RESTORED

A. Work areas are approximately shown on drawing. Locate areas to be repaired/restored by sounding with a hammer to detect hollow and deteriorated areas.

B. Mark locations using chalk or crayon.

3.4 WORKMANSHIP OF PATCHING MATERIAL:

A. Patching material workmanship shall comply with all applicable recommendations of material manufacturer's written specifications and requirements and/or as modified in this and following sections.

B. Mixing of patching material: Mix the patching material in accordance with Manufacturer's printed instructions.

C. Do not use any additives, such as bonding agents, accelerators, or retarders, in the patching material without prior written approval from the Manufacturer.

3.5 SURFACE PREPARATION: (for all patching work)

A. Patching and repair work for spalled and deteriorated materials shall be accomplished with the approved Patching material, according to manufacturer's printed instructions and as specified herein.

B. At areas to receive patches, remove all loose, spalled and deteriorating materials. If required cut away an additional 1/4 to 1/2 inch of the substrate that may be in the process of deteriorating and to ensure the surface to be patched is solid and stable. Saw cut edges of all repair areas to a minimum 1/4" depth. "Sound" remaining substrate with a hammer to verify its integrity.

C. Remove any soil, mortar, dust and other debris or foreign material from areas to receive patch.

D. Cut out sections shall be squared off at the edges. Do not overcut corners of the patch; stop short of corner and chip out remainder by hand without damaging surrounding masonry. Do not allow any feathered edges in the patch areas.

E. Roughen the substrate surface as necessary to achieve the surface roughness required by manufacturer for good bond, but do not damage the substrate surface. Moisten substrate surfaces as per manufacturer's directions.

F. For very dry or porous surfaces, pre-wet the substrate ahead of time to prevent the substrate from drawing moisture out of the patch too quickly. Re-wet the surface just before applying the patching material.

3.6 PATCHING REPAIR WORK:

- A. Prepare and mix Patching material in accordance with manufacturer's directions.
- B. Patching material shall be applied by trowel, casting-in-place or other techniques recommended by approved materials manufacturer for each specific field condition.
- C. Air, surface and product temperature must all be above minimum temperature of 50 deg F (10 deg C) at time of application and must be maintained above minimum until product has dried thoroughly.
- D. Apply patching material in one layer or several layers, according to the depth of the repairs. Comply with manufacturer's instructions when applying multiple layers for thickness of each layer, setting-up time for each layer, surface preparation between layers, etc., to ensure sound adhesion between layers. Final application of repair mortar shall be at the desired surface level and shall be tooled, shaped or carved as required to achieve proper surface profile and texture. Surfaces shall be tooled to replicate the texture, and detailing of the original surface. Do not sponge float the patch. Keep tools clean by frequent washing in clean water, but remove excess water to avoid introducing water into patch surfaces.
- E. Under hot conditions, as directed by Manufacturer, moisten repaired areas, cover and cure in accordance with manufacturer's directions. Keep patches moist and out of direct sun for at least the first day.
- F. To avoid rapid evaporation, do not patch in direct sunlight. If necessary, shade or cover work with tarpaulin or wet burlap.

3.7 PATCHING FOR DEEP OR OVERHANGING REPAIR:

- A. At areas of large, deep and overhanging repairs the installation of mechanical keying or anchoring is required. The decision whether to anchor and how frequently to provide anchors shall be based on structural requirements, the conditions of the substrate, patch dimensions and weight, and the extent to which patch integrity will rely on self adhesion alone. Typical procedures are outlined in this section and shall be modified as required.
- B. Drill 1/4" to 1/2" diameter holes at various angles, spaced 4 to 6 inches apart in staggered rows. Clean holes using compressed, oil-free air.
- C. Insert stainless steel rods into drilled holes. Set depth and projection of rods so that at least 3/4" of patching material is placed over the rods, which are secured into the holes with the specified adhesive.
- D. Prepare and mix patching material in accordance with manufacturer's directions. Comply with all safety precautions, environmental limitations and work time limitations.

E. Dampen patch area immediately prior to application of patching material and apply bond coat to create a good bond. Using a masonry brush, apply bondcoat to patch area, working into corners, edges and profile. Apply bond coat only to area of patch that can be covered with patch material mix before bond coat dries. Work bond coat into pieces of the substrate and under and around mechanical anchors. Do not apply excess bond coat; do not leave standing in puddles on the substrate. Do not allow bond coat material to run down onto surfaces which will not be repaired.

F. Apply patching material to deep sections by building up in a series of multiple lifts. Comply with manufacturer's instructions for thickness of each layer, setting-up time for each layer, and surface preparation between layers to ensure sound restoration. Work patching material into all corners of patch area and under and around mechanical anchors; including the existing coated reinforcements.

G. To re-create original ornamentation, apply an extra-thick patch. Then after the patch is partially cured the patching material shall be carved, using molding profiles and/or straight edges to restore original ornamentation. In all cases, finish patch so that it is as indistinguishable as possible from adjacent surfaces.

H. Clean any patching material residue from area surrounding the patch by sponging as many times as necessary with clean water. This should be done before patching material sets.

I. Moisten, cover and cure repaired areas in accordance with manufacturer's directions.

3.8 CASTING NEW ELEMENTS OR SECTIONS

A. In designated areas, new elements or sections shall be cast in place using specified patching compound with superplasticized admixture.

B. Prepare surfaces and install anchors in accordance with Section 3.7, above.

C. Construct molds made of wood, sheet metal, plastic, rubber molding compound or other suitable material, and fasten mold to repair area as required to secure mold during casting process.

D. Interior face of mold shall be treated for clean release of patching compounds. This may be achieved by use of polyethylene lining, high-gloss polyurethane coating, or use of approved proprietary form release agent. No form oils, silicones or teflon release agents shall be used.

E. Prepare mixture of superplasticized patching compound, using slow speed (250-450 rpm) paddle mixer. Mix consistency should be a viscous, plastic mortar. Do not add excessive liquid to produce an excessively thinned mixture.

F. Pour, pump or pack the mixture into the mold, rodding, vibrating or tapping the mold with a rubber mallet while filling. Add material in shallow increments, vibrating or tapping to remove

air bubbles and to allow the material to completely slump into the mold pattern after each addition. Once filling has begun, do not interrupt the process until the mold is completely filled.

G. Allow mold to remain in place for 24 to 48 hours to assure complete through-set. Carefully strip forms to avoid damaging the “green” casting. Rub, sand or stone surfaces as required to match texture of adjacent surfaces.

3.9 REPAIRING CRACKS AND VOIDS

A. Prepare cracked area in accordance to manufacturer's written instructions. Typical procedures are outlined in this section and shall be modified according to approved materials manufacturer.

B. Crack repair for hairline and microscopic cracks:

1. Inject cementitious crack repair material into designated cracks, using syringes, grouting pumps, or other types of injection apparatus suitable for size of crack, distance crack injection material must travel and viscosity of material used. Seal surfaces as required to prevent crack injection material from leaking out and to facilitate pumping. Take caution not to strain the face of adjacent surfaces.

2. Immediately wipe spills off surfaces with clean, wet rag and allow injection material to cure as required.

C. Crack repair for cracks larger than 1/16" and voids larger than 1/8" mm:

1. Remove loose and spalling materials, cut into crack to a minimum depth of 3/8 inches and a width of 3/16 inch. If embedded reinforcements are rusted then cut material deep enough to expose the rusting reinforcements and remove material around reinforcement to provide a minimum of 3/4 inch clearance for patch material.

2. Clean and coat exposed reinforcements at patch work with an approved rust-preventative agent.

3. Fill enlarged areas of crack repair with patching material, following repair procedures outlined in this section under Part 3, "Patch for typical repair work" and/or Part 3, "Patching for deep or overhanging repair."

D. Inject cementitious crack repair material into designated voids and cracks, using syringes, grouting pumps, or other types of injection apparatus suitable for size of crack, distance crack repair material must travel and viscosity of material used. Seal surfaces as required to prevent crack injection material from leaking out and to facilitate pumping. Take caution not to strain the face of adjacent surfaces. Immediately wipe spills off surfaces with clean rag and compatible solvent.

E. Unacceptable patches are defined as those with hairline cracks or showing separation from repair edges, or on which "hollow spots" can be detected by light impact. Remove unsound patches and refill to provide patches free of those defects.

F. Final Cleaning: No steam cleaning or additional pressure cleaning shall be performed within 28 days of patch installation. No acid or alkali cleaning agents shall be used except as recommended and/or approved by patch manufacturer.