

GUIDE SPEC

SECTION 04 01 40

Maintenance of Stone Assemblies - July 2nd 2014 rev

SECTION 04 01 40 - MAINTENANCE OF STONE ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY OF WORK

- A. Submit the following items in time to prevent delay of the work and to allow adequate time for review; do not order materials or start work before receiving the written approval:
1. Samples of all specified materials and Material Safety Data Sheets (MSDS) as appropriate.
 2. Install samples on building masonry as per **04 01 00 Section 1.7 Mock-Up**. Execute one sample for Architect approval on ornamental and subsequently on flat work demonstrating stone repair techniques with the specified (or approved equal or better) stone repair techniques as described in this section.

1.2 QUALITY ASSURANCE/TEST REQUIREMENTS

- A. Stone Patch Repair Mortar Samples: Prepare a sample of each type of repair listed below, using masonry removed from the building where designated by the Architect. Prepare, install, and finish each sample repair according to the specifications. All samples must be applied to masonry. Prepare samples in an area where they will be exposed to the same conditions as will be present on the building during curing. Allow samples to cure at least seven but preferably fourteen days before obtaining Owner's approval for color match. Mortar colors will continue to lighten as they cure and are exposed to the weather; install samples as far in advance of review as possible. Samples should be viewed from a minimum distance of 12 feet.
- B. Project Architect to approve all replacement/patching/repair of stone units prior to execution.
- C. Repair of Stone Spalls or Missing Stone Benchmarks
1. Spalls of less than 6" in diameter can be patched with stone repair mortar.
 2. Spalls larger than 6" and in locations not readily visible can be repaired with a "Dutchman" patch. Depending on the location and size of the patch, complete replacement of the stone unit may be required. Consult the Architect for final determinations.
 3. Replacement of missing stone segments (Dutchman) or full units to consist of matching stone. Provide sample to Architect for approval prior to ordering.
- D. Repair of Stone Crack and Fracture Benchmarks
1. Cracks 1/8" or less to be repaired with US Heritage Group Dispersed Hydrated Lime Injection Mortar or approved equal or better.
 2. Cracks 1/16" up to 1/4" to be repaired with color matched US Heritage Group Injection Repair Mortar or approved equal or better.

GUIDE SPEC

SECTION 04 01 40

Maintenance of Stone Assemblies - July 2nd 2014 rev

3. Surface of crack repairs and fractures to be finished with color-matched US Heritage Group Dispersed Hydrated Lime Spachtel or approved equal or better.
4. Fractures through a stone unit to be repaired utilizing solid threaded stainless steel rod (epoxy set) only where stable material no less than 6" exists on each side of the fracture.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Materials are to be delivered, stored, and handled to protect them from damage, extreme temperature, and moisture in accordance with Manufacturer's written instructions.
- B. Deliver and store material in Manufacturer's original, unopened containers with the production date shown on the container or packaging.
- C. Comply with the Manufacturer's written specifications and recommendations for mixing, application, and curing of mortars.

1.4 PROTECTION/SITE CONDITIONS

- A. Cold Weather Requirements: Do not work in temperatures below 40° F, when the substrate is colder than 40° F, or when the temperature is expected to fall below 40° F for 48 hours after installation of repair mortars. Building an enclosure and heating areas to maintain this temperature may only be done with the written approval of the Specifier.
- B. Hot Weather Requirements: **Protect repair mortar from direct sunlight and wind.** Do not use or prepare mortar when ambient air temperature is above 90° F.

PART 2 PRODUCTS

2.1 MASONRY REPAIR MORTARS, ANCHORS, INJECTION GROUT, AND EPOXY

- A. Limestone Patching Repair Mortar: Limestone patching repair mortar shall consist of a mineral-based, single component product that is mixed with water. Natural binders only; no synthetic polymers or additives shall be used. Product shall be vapor permeable. Submit color range of project limestone from the existing stone for custom color matching.
 1. **Product**: HL60 Heritage Limestone Repair Mortar, Manufactured by U.S. Heritage Group, Inc., 3516 N. Kostner Street, Chicago, Illinois 60641, Phone: 773/ 286.2100, Fax: 773/ 286.1852. Skilled masons can easily apply Heritage Restoration Mortars; no special certification is required. Designed to decrease significantly the time required to complete stone repairs, HL60 Heritage Repair Mortar for Limestone can be ready for sculpting in 3 hours at room temperature.
- B. Stone Anchors: Type 302 Threaded Solid Stainless Steel; use of carbon steel is prohibited. Anchors to be set in moisture insensitive epoxy resin. Diameter and length of anchor determined by conditions but generally are as follows - 1/4" diameter anchors for

GUIDE SPEC

SECTION 04 01 40

Maintenance of Stone Assemblies - July 2nd 2014 rev

reattachment of face bedding layers and small loose details as well as reinforcement of stone repair mortar; 1/2" diameter anchors for stone unit reattachment, lintel or architrave repair, large cracks, and large spalls.

- C. Epoxy (for steel anchor setting): Moisture insensitive epoxy resins to be used for setting stainless steel anchors and filling adjacent related cracks. Utilize clay dams to plug flow of epoxy from the stone face; remove clay dam once epoxy set.
- D. Setting Buttons: Plastic or steel washers are prohibited from use.
- E. Dispersed Hydrated Lime Injection Mortar: Injection mortar made of dispersed hydrated lime putty and filler. Designed to repair cavities and cracks no larger than 1/8" in width.
1. **Product**: DHL-IM, Dispersed Hydrated Lime Injection Mortar: Manufactured by U.S. Heritage Group, Inc., 3516 N. Kostner Street, Chicago, Illinois 60641 Phone: 773/ 286.2100 Fax: 773/ 286.1852.
- F. Dispersed Hydrated Lime Spachtel (Surface Finish) Mortar: Surface finishing mortar made of dispersed hydrated lime putty and filler. Designed to fill surface of injected cracks and voids no larger than 1/8" in smallest dimension (width or depth). Submit color range of project limestone from the existing stone for custom color matching.
1. **Product**: DHL-IM, Dispersed Hydrated Lime Spachtel: Manufactured by U.S. Heritage Group, Inc., 3516 N. Kostner Street, Chicago, Illinois 60641 Phone: 773/ 286.2100 Fax: 773/ 286.1852.
- G. Injection Grout for Masonry and Concrete: Injection grout to be a single component, cementitious, high performance material designed to stabilize and repair historic masonry and concrete. The material is formulated to inject into cracks ranging from 1/16" to 1/4".
1. Formulation: Pre-blended, mineral based, single component repair product to be mixed with water.
 2. No synthetic polymers, epoxy, portland cement or other additives shall be present in or added to injection grout mix.
 3. Submit color range of project limestone from the existing stone for custom color matching.
 4. **Product**: IG10 Injection Repair Mortar, Manufactured by U.S. Heritage Group, Inc., 3516 N. Kostner Street, Chicago, Illinois 60641 Phone: 773/ 286.2100 Fax: 773/ 286.1852. IG10 is a cement-based, high performance, injection grout designed to stabilize and repair historic masonry and concrete. Skilled masons can easily use IG10; no special certification is required.
- H. Substitutions: Approved equal or better.

GUIDE SPEC

SECTION 04 01 40

Maintenance of Stone Assemblies - July 2nd 2014 rev

PART 3 HL60 HERITAGE LIMESTONE PATCHING REPAIR MORTAR EXECUTION

3.1 WORKMANSHIP

- A. Do not use any additives, such as bonding agents, accelerators, or retardants in the mortar.
- B. Follow all manufacturer recommendations for preparation, mixing, installation, finishing, etc.

3.2 PREPARATION FOR STONE PATCHING REPAIRS

- A. Clean the area to be repaired with clean water and a bristle brush to remove any loose stone particles.
- B. Neutralize any salt deposits (efflorescence) with distilled water.
- C. Remove all loose mortar and masonry prior to installation of the repair mortar. "Sound" masonry with a hammer to verify its integrity. Chisel off delaminated stone back to sound material. If necessary, cut away an additional 1/2" of the substrate to ensure the surface to be repaired is solid and stable. Remove any sealant residue.
- D. Where cramp anchors, threaded rod anchors, or dowels have been cut and pieces remain embedded in the substrate: Anchors that are free of rust, solidly embedded, and do not project beyond the surface of the masonry unit may remain. All others should be removed.
- E. Cut the edges of the repair area to provide a minimum depth of 1/4". The edges of the repair should be square cut. Do not allow any feathered edges in the repair area. (For patches less than 1/4" deep use US Heritage Group HL15.)
- F. Install mechanical anchors in all repair areas if specified on the Contract Drawing or as otherwise directed by the Architect.
- G. Clean all dust from surface and pores of the substrate, using clean water and a scrub brush.
- H. Pre-wet the substrate ahead of time to prevent the substrate from drawing moisture out of the repair too quickly. Re-wet the surface immediately before applying the repair material, dampening with clean water until the surface is glistening with no standing water.

3.3 MIXING MORTAR FOR REPAIR

- A. It is recommended that a dust mask be worn during mixing. Do not mix more material than can be used within 60 minutes. Discard any mixed material that has been unused for 60 minutes or more.

GUIDE SPEC

SECTION 04 01 40

Maintenance of Stone Assemblies - July 2nd 2014 rev

- B. All repairs require a minimum two-coat application consisting of a skim coat and a build-out coat. Additional build-out coats may be applied to meet the required thickness.

Skim Coat: For the initial skim coat, mix approximately 5 parts dry powder to approximately 1 part potable water. The prepared mixture should be the consistency of peanut butter. Temperature and humidity will affect the amount of water required. Mixing may be done by hand or using a low-speed drill (300 to 450 rpm) for 2 to 4 minutes. Do not over mix.

Build-Out Coat: The consistency of the mortar for the build-out coat should be similar to wet sand. For any additional build-out coats use slightly less water in the mix. Working time is approximately 60 minutes depending on temperature, humidity, and wind conditions.

3.4 APPLICATION OF REPAIR MATERIAL

- A. Skim coat: Pre-wet the stone surface, so that it is glistening wet, with no standing water. Remove loose material from the stone and wash down the stone a second time. The installation of non-corrosive screws and wires when the stone repair exceeds 4" in thickness is recommended. Use trowels and plaster detailing tools to apply the skim coat to small areas. **IMPORTANT:** Make sure the skim coat adheres to all surfaces of the repair area of the stone. Check the skim coat after 5 minutes. Do not allow the surface of the skim coat to dry completely. If it does dry out, moisten the surface with clean water. The drying time will be affected by weather conditions; careful monitoring is critical.
- Additional Coats: Scoop wet mix from the mixing container by hand (wear latex gloves) or with a small trowel and apply it by pressing and rubbing it into the skim coat. Make sure to fill all pores and voids of the stone. The repair mortar may be built up to a maximum thickness of 3" in one lift. Finger test each coat before applying the next. If the mortar moves under your finger, wait until it sets before applying the next coat. If additional coats are applied the next day or later, you must wet and scratch the previous coat before adding additional coats.

3.5 FINISHING TECHNIQUES

- A. The surface of the repair may be either tooled or scraped to the required finish. You may finish the same day or wait until the following day. For soft edges, carve the mortar when it is wet. For sharp edges, carve with sharp carving tools when it is partially cured. It may be desirable to wait longer for particular finishes. Always test finishing techniques before applying to large areas. Craftsmen should understand the timing of the finishing techniques and make adjustments for weather conditions. Air chisels may be used to create the desired finishes.
1. Timing for finishing and actual cure times are completely reliant on air temperatures and relative humidity. Monitor actual site conditions closely.

3.6 CURING PROCEDURE

- A. Keep the repair area, plus an additional 2" (2 inches) surrounding the repair area damp for a minimum of 36 hours. Spray mist the repair area with clean water, covering with

GUIDE SPEC

SECTION 04 01 40

Maintenance of Stone Assemblies - July 2nd 2014 rev

plastic sheeting to keep the repair area damp. Adjust curing methods to prevent the repair from drying out too quickly.

- B. Curing methods will vary in different parts of the country and at different times of the year, calling for different amounts of water to be used in the first 36 hours after application. Adjustments also have to take into account how much time is remaining before freezing weather arrives.

3.7 CLEAN UP

- A. Remove mortar from tools and mixing equipment with water immediately after use. Repair mortar is difficult to remove after it has set.

PART 4 DHL-IM DISPERSED LIME INJECTION STONE REPAIR EXECUTION

4.1 WORKMANSHIP

- A. Do not use any additives, such as bonding agents, accelerators, or retardants in the material.
- B. Submit samples of the masonry prior to ordering material to ensure proper color matching.
- C. Follow all manufacturer recommendations for preparation, mixing, installation, finishing, etc.

4.2 PREPARATION FOR REPAIRS

- A. Keep all materials from staining adjacent intact masonry surfaces.
- B. Clean all dust from surface and pores of the substrate, using clean water and a scrub brush. Flush out crack with clean water in order to remove small particles.
- C. Pre-wet the stone with distilled water to prevent the substrate from drawing moisture out of the repair too quickly.

4.3 MIXING

- A. No mixing is required, however the material may have settled during storage and shipping. Shake container prior to use to ensure full distribution of lime particulate within the mix.
- B. DHL-IM may be diluted with distilled water up to 5% by weight to penetrate smaller cracks and voids.

GUIDE SPEC

SECTION 04 01 40

Maintenance of Stone Assemblies - July 2nd 2014 rev

4.4 APPLICATION OF REPAIR MATERIAL

- A. Install material by means of a packer or injection tool after pre-wetting with distilled water. Typical syringe size 0,08-0,25mm.
- B. Diluted material may be brush applied to very fine cracks.
- C. DHL-IM has no working time, use immediately. To prevent from drying any unused material should remain in a closed container.

4.5 CURING PROCEDURE

- A. Air and object temperature should not drop below 42° F and exceed 120° F during curing. Full curing time is dependant on temperature and relative humidity; typical curing timeframe is 48 hours.

4.6 CLEAN UP

- A. Remove material from tools and mixing equipment with water immediately after use. DHL-IM is difficult to remove after it has set.

PART 5 IG10 NATURAL INJECTION GROUT STONE REPAIR EXECUTION

5.1 WORKMANSHIP

- A. Epoxy, additives, acrylic bonding agents, accelerators, or retardants:
 - 1. Not permitted in material.
 - 2. Not permitted on wall face or individual masonry unit surface.
- B. Keep all replacement materials from smearing/staining adjacent surfaces. Adjust water content of material during placement to execute the cleanest possible work without compromising material performance. If needed, request assistance from the manufacturer to establish content ratio to meet this requirement.
- C. Follow all manufacturer recommendations for preparation, installation, finishing, etc.
- D. Mixing of individual ingredients at the job site shall not be permitted.

5.2 PREPARATION FOR REPAIRS

- A. Keep all materials from staining adjacent intact masonry surfaces.
- B. Cut away loose and deteriorated material at the injection site. Clean the area to be repaired with clean water and a natural bristle brush to remove any loose particles. Flush out the crack with water to remove debris. Neutralize any salts (efflorescence) with distilled water, etc.

GUIDE SPEC

SECTION 04 01 40

Maintenance of Stone Assemblies - July 2nd 2014 rev

- C. Pre-wet the substrate ahead of time to prevent the substrate from drawing moisture out of the repair too quickly. Re-wet the surface immediately before applying the repair material until glistening with no standing water.
- D. Set the appropriate injection ports.

5.3 MIXING FOR REPAIR

- A. It is recommended that a dust mask be worn during mixing. Do not mix more material than can be used within 10 minutes. Discard any mixed material that has been unused for 30 minutes or more.
- B. Mix approximately 4 parts dry powder to approximately 1 part potable water. The prepared mixture should be the consistency of heavy cream. Mix at 450 rpm with a drill outfitted with a ribbon blade. Add one-half the contents, mix for 1 minute, add the remaining material, and vigorously mix for 2 minutes. Do not over mix.
- C. Temperature and humidity will affect the amount of water required to achieve the desired consistency.

5.4 APPLICATION OF REPAIR MATERIAL

- A. Follow manufacturers required directions.
- B. Inject cracks from 1/16" up to 1/4" wide only.
- C. Inject the crack fully.
- D. Cap the cracks and seal the injection ports with appropriate stone repair mortar. Finish to match the adjacent stone surfaces.

5.5 FINISHING TECHNIQUES

- A. For heavily rusticated (rock face) masonry surfaces, finish the crack area with stone patching mortar tooled to match the adjacent stone surfaces.
- B. For honed masonry surfaces, sprinkle aggregate matching the masonry over the injection grout prior to curing to achieve better matching to adjacent masonry surface texture.

5.6 CURING PROCEDURE

- A. Curing methods will vary in different parts of the country and at different times of the year. Covering the surface with tarps or damp cloths may be required in very dry or hot environments to protect the surface from rapid curing.

GUIDE SPEC

SECTION 04 01 40

Maintenance of Stone Assemblies - July 2nd 2014 rev

5.7 CLEAN UP

- A. Remove material from tools and mixing equipment with water immediately after use. Repair grout is difficult to remove after it has set.

END OF SECTION