SECTION 04 01 00

MASONRY MORTARING, GROUTING, AND MAINTENANCE OF MASONRY AND STONE

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\*\* NOTE TO SPECIFIER \*\* US Heritage Group, Inc.; Custom Mortar Repair and Restoration Products.
This section is based on the products of US Heritage Group, Inc., which is located at:10248 Franklin Ave.Franklin Park, IL 60131Tel: 773-286-2100Fax: 773-286-1852Email: [request info (monika@usheritage.com)](https://arcat.com/rfi?action=email&company=US%252BHeritage%252BGroup%252C%252BInc.&message=RE%253A%2520Spec%2520Question%2520(04010uhg)%253A%2520&coid=48051&spec=04010uhg&rep=&fax=773-286-1852)
Web: <http://www.usheritage.com>
 [ [Click Here](https://arcat.com/company/us-heritage-group-inc-48051) ] for additional information.
US Heritage Group, Inc. can assist you by finding or manufacturing the right mortar, lime putty or stone restoration product. Our custom mortar matching and laboratory services are specifically set up to handle heritage mortars and restoration samples. We also offer consulting services to specifiers and installers who work on everything from traditional masonry preservation projects to sustainable new design.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Masonry mortaring and grouting.
		2. Maintenance and restoration of masonry:
			1. Cleaning; water and/or chemical.
			2. Replacement and repair of stone units.
			3. Repointing mortar joints.
			4. Parapet rebuilding.
			5. Repair of damaged masonry.
		3. Maintenance and restoration of stone assemblies.
	1. SUMMARY
		1. For repointing, resetting, relaying of historic masonry as shown on the Drawings and as specified in the Construction Documents and Preservation Briefs 1, 2 revised, and 6, U.S. Department of the Interior, National Park Service, Technical Preservation Services.
	2. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 04 20 00 - Unit Masonry
		2. Section 04 40 00 - Stone Assemblies
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American Concrete Institute(ACI):
			1. ACI 530 - Building Code Requirements for Masonry Structures.
			2. ACI 530.1 - Specifications for Masonry Structures.
		2. ASTM International (ASTM):
			1. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
			2. ASTM C5 - Standard Specification for Quicklime for Structural Purposes
			3. ASTM C404 - Standard Specification for Aggregates for Masonry Grout
			4. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
			5. STM C979 - Standard Specification for Pigments for Integrally Colored Concrete
			6. ASTM C1489 - Standard Specification for Lime Putty for Structural Purposes
		3. Preservation Briefs:
			1. No. 1 - The Cleaning and Waterproof Coating of Historic Buildings, Robert C. Mack, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Technical Preservation Services.
			2. No. 2 - Repointing Mortar Joints in Historic Brick Buildings, Robert C. Mack, John P. Speweik, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Technical Preservation Services.
			3. No. 6 - Dangers of Abrasive Cleaning to Historic Buildings, Anne E. Grimmer, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Technical Preservation Services.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Shop Drawings: Indicate special supports for the work. Detail shoring, bracing, scaffolding, and temporary or permanent support. Contractor to supply scaffolding Drawings for permit.
		3. Submit the following items in time to prevent delay of work and to allow adequate time for review of submittals, if needed. Do not order materials or start execution of the Work before receiving written approval:
			1. Written certificates from mortar manufacturer stating installers of the repointing mortars have successfully completed the training workshop for installation of the mortar or have met alternative workmanship qualifications acceptable to the manufacturer or provide written certification from Manufacturer that site training services have been contracted.
				1. On-site training is available from U.S. Heritage Group, Inc., at 3516 North Kostner Ave., Chicago, IL 60641 Phone: 773-286-2100; Fax 773-286-1852.
			2. Samples of specified materials and Material Safety Data Sheets (MSDS) as appropriate.
			3. Certificates, except where material labels provide such certification by the producers of the materials, that materials supplied comply with requirements of these specifications and appropriate standards.
			4. Color and aggregate match of repointing mortar samples to mortar identified as original or specified alternative.
			5. Written verification that specified items will be used. Provide purchase orders, shipping tickets, receipts, etc. to prove that specified materials were ordered and received.
			6. 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.
				1. Contractors proposal/bid can serve this purpose.
		4. Product Data: For cleaning compounds, cleaning solutions, and manufacturer's printed literature for each product.
			1. Material Safety Data Sheets (MSDS) as appropriate.
		5. Manufacturer's Installation Instructions: Installation procedures for products selected for use, manufacturer's installation instructions, perimeter conditions requiring special attention, and test data indicating compliance with requirements, and installation instructions.
		6. Samples: Submit four unit samples of masonry units to illustrate color, texture, and extremes of color range to match existing where replacements are necessary.
		7. Samples: Submit two samples of each mortar, 6 total. in addition to the required mock-up, comparable in size to the mortar joint, illustrating mortar color and color range.

\*\* NOTE TO SPECIFIER \*\* Delete mortar samples not required.

* + - 1. Sample 1a: Limestone Mortar.
			2. Sample 1b: Limestone Mortar.
			3. Sample 2a: Face Brick Mortar.
			4. Sample 2b: Face Brick Mortar.
			5. Sample 3a: Common/Back-Up Brick Mortar.
			6. Sample 3b: Common/Back-Up Brick Mortar.
	1. SUBSTITUTIONS
		1. If alternative methods and materials to those indicated are proposed for any phase of restoration work, provide written description, and program of testing to demonstrate effectiveness for use on this project.
			1. Provide documentation showing compliance with the requirements for substitutions and the following information:
				1. Coordination information, including a list of changes needed to other work that will be necessary to accommodate the substitution.
		2. A comparison of the substitution with specified products and methods, including performance, weight, size, durability, and visual effect.
		3. Certification that substitution conforms to contract documents and is appropriate for applications indicated.
			1. 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. Submitting party must pay for testing.
	2. QUALITY ASSURANCE
		1. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures, ACI 530.1 Specification for Masonry Structures, and local authorities having jurisdiction.
		2. Masonry restoration to be performed by a craftsperson well-versed with historic lime mortar formulations, curing conditions and performance characteristics.
			1. Contractor must provide proof of such experience to the Architect by submitting sufficient proven project experience.
				1. 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.
		3. Only skilled journeymen masons who are familiar and experienced with the materials and methods specified and are familiar with the design requirements are to be used for masonry restoration. A skilled journeyman mason, trained and certified by the specified manufacturer, must be present at all times during masonry restoration and personally direct the work.
		4. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
		5. Source Limitations: Obtain materials for stone repair and mortar repointing from a single manufacturer source to ensure consistent performance and match quality, including color, aggregate, and detailing.

\*\* NOTE TO SPECIFIER \*\* Include mock-up if the project size or quality warrant the expense. The following is one example of how a mock-up on might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up:
			1. See Section 01 40 00 - Quality Requirements.
			2. Benchmark Mock-Ups: Establish standards for execution of masonry work that has been installed, approved, and reviewed by bidders prior to bidding.
				1. Field Construction Mock-ups will be evaluated against Benchmark Mockups as basis for approval.
				2. Retain benchmark mockups in undisturbed condition, suitably marked, during restoration as a standard for judging completed work.
			3. Field Construction Mock-ups: Prior to start of general masonry restoration prepare sample panels and sample areas on the building where directed by the Architect.
				1. Obtain Architect's written approval before proceeding with Work.
				2. Document materials in mock-up conform to project specifications.

\*\* NOTE TO SPECIFIER \*\* Delete mock-up options not required.

* + - 1. Cleaning: Testing must confirm the cleaning specification prior to wholesale execution on the building.
				1. Prepare 3 separate spot-cleaning sample areas for each type required. Determine extent of cleaning, cleaning methods, dwell time, and cleaning products.
				2. One test sample must consist of a hot water wash at low psi using a flat 25-50 degree wide spray stainless steel tip.

Record and note all dwell times, surface, and air temperatures at the time of testing each possible solution.

* + - * 1. Architect to be present during mockup execution.
				2. Note cleaning detergent or chemical mixes, psi, nozzle orifice distance from wall face, manual manipulation of the surface (scrubbing), dwell times, and any other specific cleaning procedures.
				3. Repeat, using different cleaning methods as per specifications on up to 3 locations, until acceptable cleaning standard is reached without causing surface damage i.e. etching, scratching, etc.
			1. Stone Crack Repair:
				1. Prepare one control sample of each of the project required stone crack repair techniques.

Dispersed hydrated lime injection mortar; cracks 1/8 inches (3 mm) or less.

Injection repair mortar; cracks wider than 1/16 up to 1/4 inch (1.5 to 6 mm).

Stone fracture repair; repair of through stone cracks.

* + - 1. Stone Patching With Stone Repair Mortar:
				1. Project Architect tis to approve all replacement/patching/repair of stone units prior to execution.
				2. Prepare separate sample area of a masonry unit for each type of stone patch repair required, ornamental and face stone.

Prepare, install, and finish each sample according to specifications.

Sample must be applied to the actual masonry. Samples should cure a minimum of 14 days prior to Architect approval.

* + - * 1. 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 ft (3.66 m).

* + - * 1. Repair of Stone Spalls or Missing Stone Benchmarks

Spalls of less than 6 inch (152 mm) in diameter can be patched with stone repair mortar.

Spalls larger than 6 inch (152 mm) 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.

Replacement of missing stone segments (Dutchman) or full units to consist of matching stone.

Provide sample to Architect for approval prior to ordering.

* + - * 1. Repair of Stone Crack and Fracture Benchmarks.

Cracks 1/8 inch (3 mm) or less to be repaired with US Heritage Group Dispersed Hydrated Lime Injection Mortar or approved equal or better.

Cracks 1/16 up to 1/4 inch (1.5 to 6 mm) to be repaired with color matched US Heritage Group Injection Repair Mortar or approved equal or better.

Surface of crack repairs and fractures to be finished with color-matched US Heritage Group Dispersed Hydrated Lime Spachtel or approved equal or better.

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. Mortar Repointing:
				1. Prepare 4 separate sample areas of approximately 3 ft high by 3 ft wide for each type of repointing required.

Sample 1a: Brick Mortar Joint Preparation.

Sample 1b: Brick Mortar Joint Installation/Finishing.

Sample 2a: Limestone Mortar Joint Preparation.

Sample 2b: Limestone Mortar Joint Installation/Finishing.

* + - * 1. Joint Preparation: Demonstrate methods and quality of workmanship expected in removal of mortar from joints.
				2. Joint Mortar Installation: Demonstrate quality of materials and workmanship expected in pointing mortar joints.
				3. Prepare, install, and finish each sample according to specifications.
				4. Apply sample to the actual masonry.
				5. Cure samples a minimum of 14 days prior to Architect approval.
			1. Locate mock-ups where directed by Architect.
			2. Acceptable panel illustrating results of all masonry restoration techniques described above to become standard for work of this section. Retain acceptable panels in undisturbed condition, suitably marked, during restoration as a standard for judging completed work.
	1. PRE-INSTALLATION CONFERENCE
		1. Section 01 30 00 - Administrative Requirements.
		2. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.
	2. DELIVERY, STORAGE, AND HANDLING
		1. See Section 01 60 00 - Product Requirements.
		2. Deliver masonry, mortar, stone, and all other materials neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.
		3. Store masonry restoration product ingredients in manufacturer's packaging, or when delivered loose, with adequate weatherproof covering.
		4. Deliver materials to site in manufacturer's original unopened containers and packaging, bearing labels as to type and names of products and manufacturers.
		5. Deliver and store masonry restoration material in manufacturer's original, unopened containers with the grade, batch, and production data shown on the container or packaging.
		6. 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.
		7. Protect 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.
		8. Comply with manufacturer's written specifications and recommendations for mixing, application, and curing of repointing mortars and patching materials.
		9. Deliver products on time to avoid construction delays.
		10. Deliver and store products in manufacturer's original packaging with identification labels intact.
		11. Store products protected from weather and at temperature and humidity conditions recommended by manufacturer.
	3. ENVIRONMENTAL REQUIREMENTS
		1. See Section 01 60 00 - Product Requirements.
		2. Cold Weather Requirements: In accordance with ACI 530.1 work shall cease when ambient temperature or temperature of masonry units is less than 40 degrees F (4 degrees C) will remain so for at least 48 hours after completion of work.
		3. Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower the freezing point of mortar using admixtures or anti-freeze agents, and do not use chlorides in the mortar.
		4. Hot Weather Requirements: In accordance with ACI 530.1 work shall cease when ambient temperature is greater than 100 degrees F (38 degrees C) or surface and ambient air temperature is greater than 90 degrees F (32 degrees C) with wind velocity greater than 8 mph (13 km/h).
			1. Phase masonry restoration during hot weather by completing building segments on the shady side of the building and/or schedule installation of materials during cooler evening hours to prevent premature evaporation of moisture in the mortar and other products.
		5. Do not apply products under conditions outside manufacturer's requirements, which include:
			1. Surfaces that are frozen; allow complete thawing prior to installation.
			2. When surface or air temperature is not expected to remain above 40 degrees F (4 degrees C) for at least 48 hours after application.
			3. Wind conditions that may blow materials onto surfaces not intended to be treated.
			4. Less than 24 hours after a rain.
			5. When rain is expected less than 6 hours after installation.
	4. SEQUENCING
		1. See Section 01 10 00 - Summary.
		2. Perform repointing after cleaning masonry surfaces.
	5. OTHER PROJECT CONDITIONS
		1. Protect persons, motor vehicles, building site, vegetation, and surrounding buildings from injury resulting from masonry restoration work.
			1. Includes surface areas on adjacent wall surfaces or roofs not included in this scope of work.
		2. Prevent repointing mortar from staining the face of masonry or other surfaces to be left exposed. Immediately remove all repointing mortar and other masonry restoration products that comes in contact with such surfaces.
		3. Cover partially complete work when work is not in progress.
		4. Protect sills, ledges, and projections from droppings.
		5. Damage occurring to the building as a result of work of this section or Contractor's failure to protect against such damage will be the Contractor's responsibility. The Contractor will restore damaged areas to complete satisfaction of Architect at no expense to the Owner.
	6. WARRANTY
		1. See Section 01 78 23.19 - Preventative Maintenance Instructions.
		2. Provide manufacturer's standard warranty for not less than one year, commencing on Date of Substantial Completion.
	7. SCHEDULING
		1. Section 01 30 00 - Administrative Requirements.
		2. Perform cleaning, washing, stripping, repointing, etc. to exterior masonry and stone between hours of 7 AM to 9 PM.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: US Heritage Group, Inc., which is located at:10248 Franklin Ave.Franklin Park, IL 60131Tel: 773-286-2100Fax: 773-286-1852Email: [request info (monika@usheritage.com)](https://arcat.com/rfi?action=email&company=US%252BHeritage%252BGroup%252C%252BInc.&message=RE%253A%2520Spec%2520Question%2520(04010uhg)%253A%2520&coid=48051&spec=04010uhg&rep=&fax=773-286-1852);Web: <http://www.usheritage.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. MASONRY MORTARING AND GROUTING
		1. Components:
			1. Mortar Aggregate: Based on ASTM C144 to match existing historic mortar as per mortar analysis sand gradation chart.
			2. Natural Hydraulic Lime: To meet standards of EN459 for composition and compressive strength.
			3. Lime Putty: Slaked from high calcium quicklime to meet standards ASTM C5 and C1489, composed of minimum 90 percent calcium hydroxide, aged minimum of 3 months.
			4. Pigments: Must meet ASTM C979.
			5. Grout Aggregate: Meet ASTM C404, reference mortar lab analysis report.
			6. Water: Clean and potable.
			7. Admixes: Antifreeze, calcium chloride, air entrainers, etc. are not permitted.
		2. Mortar Mixes:
			1. Existing mortar is non-permeable in composition on existing limestone and face brick. The mortar mix in the common/back-up brick is unknown.
				1. Replacement mortar mixes must be more permeable than the remaining mortar and suitable for limestone, face brick, and common/back-up brick respectively.
				2. Mortar for Face Brick Masonry:

US Heritage Group, Inc., Heritage Custom Blended Mortar.

One (1) part slaked lime putty binder with pigment to match color of existing unweathered mortar

2.5 parts clean, well-graded sand composed of round to sub-angular particles to match existing mortar aggregate color by particle size distribution per mortar analysis sand gradation chart.

\*\* NOTE TO SPECIFIER \*\* Delete option if not required.

Binder and binder to aggregate ratio formulation assumed pending final lab replacement mix recommendations.

* + - * 1. Mortar for Indiana Limestone Masonry:

US Heritage Group, Inc., Heritage Custom Blended Mortar.

One (1) part natural hydraulic lime binder with pigment to match color of existing unweathered mortar.

2.5 parts clean, well-graded sand composed of round to sub-angular particles to match existing mortar aggregate color by particle size distribution per mortar analysis sand gradation chart.

\*\* NOTE TO SPECIFIER \*\* Delete option if not required.

Binder and binder to aggregate ratio formulation assumed pending final lab replacement mix recommendations.

* + - * 1. Mortar for Common/Back-up Brick Masonry:

US Heritage Group, Inc., Heritage Custom Blended Mortar.

One (1) part natural hydraulic lime binder with pigment to match color of existing unweathered mortar

2.5 parts clean, well-graded sand composed of round to sub-angular particles to match existing mortar aggregate color by particle size distribution per mortar analysis sand gradation chart.

\*\* NOTE TO SPECIFIER \*\* Delete options if not required.

Binder and binder to aggregate ratio formulation assumed pending final lab replacement mix recommendations.

* + - * 1. Substitutions: Approved equal or better.
			1. Mortar Mixing:
				1. Pre-mixed US Heritage Group Custom Blended Mortar will arrive on site in tamper-resistant waterproof sealed containers.
				2. Water component to be added as per manufacturer's recommendations and instructions.
				3. Re-temper as per manufacturer's recommendations only.
				4. Mixing of individual mortar ingredients on site will not be permitted.

\*\* NOTE TO SPECIFIER \*\* Delete article not required.

* 1. MAINTENANCE AND RESTORATION OF STONE ASSEMBLIES
		1. Masonry Repair Mortars, Anchors, Injection Grout, and Epoxy:
			1. Limestone Patching Repair Mortar:
				1. A mineral-based, single component product mixed with water. Natural binders only; no synthetic polymers or additives used. Product to be vapor permeable. Submit color range of project limestone from the existing stone for custom color matching.

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.

* + - * 1. Skilled masons can apply Heritage Restoration Mortars; no special certification is required.
				2. Mortar can be ready for sculpting in 3 hours at room temperature.
			1. Stone Anchors:
				1. Type 302 Threaded Solid Stainless Steel; Use of carbon steel is prohibited. Anchors to be set in moisture insensitive epoxy resin.
				2. Diameter and length of anchor determined by conditions but generally are as follows:

Diameter: 1/4 inch (6 mm) anchors for reattachment of face bedding layers and small loose details as well as reinforcement of stone repair mortar.

Diameter: 1/2 inch (13 mm) diameter anchors for stone unit reattachment, lintel or architrave repair, large cracks, and large spalls.

* + - 1. Epoxy for Steel Anchor Setting:
				1. 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.
			2. Setting Buttons: Plastic or steel washers are prohibited from use.
			3. Dispersed Hydrated Lime Injection Mortar:
				1. Injection mortar made of dispersed hydrated lime putty and filler. Designed to repair cavities and cracks no larger than 1/8 inch (3 mm) in width.

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.

* + - 1. Dispersed Hydrated Lime Spachtel (Surface Finish) Mortar:
				1. 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 inch (3 mm) in smallest dimension; width or depth. Submit color range of project limestone from the existing stone for custom color matching.

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.

* + - 1. Injection Grout for Masonry and Concrete:
				1. Single component, cementitious, high performance material designed to stabilize and repair historic masonry and concrete.
				2. Inject into cracks 1/16 to 1/4 inch (1.5 to 6 mm).

Formulation: Pre-blended, mineral based, single component repair product to be mixed with water.

No synthetic polymers, epoxy, Portland cement or other additives are to be present in or added to injection grout mix.

Submit color range of project limestone from existing stone for custom color matching.

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.

* 1. MAINTENANCE AND RESTORATION OF MASONRY
		1. Repointing Mortar Materials:
			1. Prepared and placed in accordance with the Department of the Interior National Park Service Cultural Resources Preservation Briefs 2, "Repointing Mortar Joints in Historic Masonry Buildings," Revised edition, October 1998, and in compliance with the guidelines set forth by the Secretary of the Interior's Standards for Rehabilitation.
			2. Repointing Mortar: To match the original in color, composition, aggregate size, and aggregate appearance as determined by mortar analysis sand gradation chart.
				1. Compressive Strength: Equal or less than the compressive strength of the original mortar and surrounding masonry.
				2. To contain the same ingredient proportions of the original mortar.
			3. Replacement Mortar Ingredients and Mortar Formulations:
				1. To be established from mortar analysis findings and recommendations.
				2. Mortar Analysis: To be executed on samples collected from masonry elements of original mortar (meaning located at a minimum depth of 3 times the width of the mortar joint) unless otherwise specified in writing by Architect.

To be ordered from laboratory by Architect; mortar analysis lab report to be released by Architect.

* + - 1. Mortar Analysis Report: Include delivery of a sand gradation chart composed of actual physical samples of aggregate from analyzed mortar sample, in accurate relative proportion, to visually establish matched mortar aggregate requirements.
			2. Mortar Analysis Laboratory: Supply samples of pre-mixed mortar, to match mortar analysis report findings and recommendations, in sufficient volume for mock up installation at the site.
				1. Mortar Sample for Mock-Up: To include two (2) quality check samples of properly finished and cured mortar, made from the mock up material, installed in 1/2 x 3 inch (13 x 76 mm) plastic channels marked with mortar analysis code and mock up production date/batch code.
				2. Mortar Analysis Laboratory Contact: Tom Glab, Laboratory Manager, U.S. Heritage Group, Inc., 3516 North Kostner Ave. Chicago, IL 60641 Phone: 773-286-2100 Fax: 773-286-1852. Email: info@usheritage.com; www.usheritage.com.
			3. Mixing of individual mortar ingredients at the construction site is not permitted.
			4. Repointing Mortars: To be pre-blended in single containers in a factory-controlled environment. Ingredients to be converted from volume measurements to weight measurements to ensure quality production of the mortar.
				1. Containers to be marked including manufacturing date and batch number.
				2. Manufacturer is required to maintain production-sampling procedures for each batch for quality control purposes.

Provide samples of proposed materials for mock up panels at the site.

* + - * 1. All pre-blended products are to meet applicable ASTM standards and project specification requirements.
				2. Mortar Materials Contact: Sales, U.S. Heritage Group, Inc., 3516 North Kostner Ave., Chicago, IL 60641 Phone: 773-286-2100 Fax: 773-286-1852. Email: info@usheritage.com; www.usheritage.com.

Mortar supplied from other suppliers is acceptable provided these sources meet the standards outlined in this document, match the historic mortar formulation and aesthetics, and meet or exceed the quality standards of USHG mortars.

* + 1. Masonry Restoration Cleaning:
			1. Masonry Cleaners to be in accordance with the Department of the Interior National Park Service Cultural Resources Preservation Brief 1, "The Cleaning and Waterproof Coating of Masonry Buildings," and Preservation Brief 6, "Dangers of Abrasive Cleaning to Historic Buildings," and in compliance with the guidelines set forth by the Secretary of the Interior's Standards for Rehabilitation.
			2. Cleaning Baseline Procedure:
				1. Hot water wash at low psi. If hot water wash proves to be insufficient, see item "G" for acceptable manufacturers of alternate cleaning products.
				2. Pressure to be measured at the gun/nozzle or as closely to it as possible. 200-300 psi may be satisfactory; 400-800 psi (field test psi ranges) are more typical. A nylon bristle brush may be used to supplement the water wash if it does not remove or damage the masonry surface.
				3. Nozzle Size and Configuration: Stainless steel flat tip with 25-50 degree wide spray. Evaluate and test the distance of the wall surface from the nozzle orifice during the mock-up phase.
			3. Algae Growth: Treat areas of algae/moss growth with an anti-fungal agent prior to masonry cleaning.
			4. Sample Test Cleaning Area: Refer to Section 1.1 - Mock-Up, E - Cleaning for requirements.
			5. All cleaning techniques should use the gentlest means possible to avoid etching, staining, bleaching, masonry damage, or increase of PH levels.
			6. The goal of the masonry cleaning is not to remove 100 percent of surface soiling but to generally enhance the masonry appearance by maximizing removal of soiling caused by pollution, efflorescence, and biological growth while minimizing risk of damage to masonry. Architect will establish parameters on-site for acceptable levels of cleaning.
			7. Heavily Soiled Areas (likely carbon and sulfates): The undersides of sills, ornament, belt courses, etc., may require alternate cleaning methods or additional applications of cleaner to achieve successful results.
				1. Black Encrustations: Diedrich Chemicals Restoration Technology, Model 808 Black Encrustation Remover (for spot treatment of carbon encrusted black streaks).
				2. Surface Grime:

Diedrich Technologies 101 or 101G Masonry Cleaner.

Pro So Co, Sure Klean, Enviro Klean EK Restoration Cleaner.

Pro So Co, Sure Klean, Masonry 766 Prewash and Afterwash.

Pro So Co, Sure Klean, Limestone Restorer.

Diedrich Technologies, Envirostore 100.

* + - * 1. Substitutions: Approved equal or better.
			1. Dwell Times: For cleaning methods, testing and implementation, dwell times to be be closely watched and adhered to in an effort to avoid damaging the masonry (etching the surface).
				1. Dwell times will vary and should be monitored during the testing phase to determine the most effective time resulting in no damage.
			2. Properly protect all adjacent wall surfaces, roofs, clock faces, windows, doors, glass, adjacent plant material, etc., from overspray.
			3. Clean only the areas specified in the exterior elevation drawings.
				1. Clean exposed surfaces of specified masonry using materials specified, so resulting surfaces have a uniform appearance.
			4. Cleaning Stains and Tough Dirt: Select appropriate cleaner in accordance with manufacturer's instructions and recommendations; use cleaner and cleaning methods selected to minimize damage to surfaces and deterioration of appearance.
			5. Install and clean up as per manufacturer's recommendations and standards.
				1. Capture, store, and dispose of all cleaning products, overspray, wash, and after wash as per EPA and local government standards.
			6. Manufacturers:
				1. Mortar Materials Contact: Sales, U.S. Heritage Group, Inc., 3516 North Kostner Ave., Chicago, IL 60641 Phone: 773-286-2100 Fax: 773-286-1852. Email: info@usheritage.com; [www.usheritage.com](http://www.usheritage.com)
				2. Cleaning Materials:

PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. ASD. Tel: (800) 255-4255 or (785) 865-4200. Fax: (785) 830-9797. Email: marketing@prosoco.com; [www.prosoco.com](http://www.prosoco.com)

Diedrich Technologies, Inc., 7373 South 6th Street, Oak Creek, WI 53154. Tel: (800) 283-3888; [www.diedrichtechnologies.com](http://www.diedrichtechnologies.com)

* + - * 1. Substitutions: See Section 01 60 00 - Product Requirements.
		1. Components:
			1. Cleaning Agent: Premixed solvent cleaner type.
			2. Blasting Sand: Not permitted.
			3. Mortar Materials: As specified in this specification.

\*\* NOTE TO SPECIFIER \*\* Delete or add stone and brick type options as required.

* + - 1. Stone Type: \_\_\_\_\_\_\_\_. (carved and ornamental).
			2. Brick Type: \_\_\_\_\_\_\_\_. Solid face brick.
			3. Brick Type: \_\_\_\_\_\_\_\_. Solid common brick.
1. EXECUTION
	1. EXAMINATION
		1. Section 01 30 00 - Administrative Requirements.
		2. Verify surfaces to be cleaned and restored are ready for work of this section.
		3. Examine conditions, with installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.
		4. Do not proceed until unsatisfactory conditions have been corrected.
		5. Verify that substrates are acceptable for product installation; do not begin until substrates meet manufacturer's requirements.
		6. Do not begin work until test panels/mock-ups are approved by Architect and Owner.
		7. Replacement of masonry units to be confirmed by Architect prior to execution.
	2. PREPARATION
		1. Protect elements surrounding work of this section from damage or disfiguration.
		2. Immediately remove stains, efflorescence, or other excess resulting from work of this section.
		3. Protect roof membrane and flashings from damage. Lay 1/2 inch (13 mm) plywood on roof surfaces over full extent of work area and traffic route.
		4. Provide waterproof dams to divert flowing water to exterior drains and catch basins.
		5. Carefully remove and store fixtures, fittings, finishing hardware, and accessories.
		6. Close off, seal, mask, and/or board up areas, materials, and surfaces not receiving work of this section to protect from damage.
		7. Construct dust proof and weatherproof partitions to close off occupied areas, if any.
	3. PREPARATION FOR STONE ASSEMNLY MAINTENANCE
		1. HL60 Heritage Limestone Patching Repair Mortar Execution.
			1. Workmanship:
				1. Do not use additives such as bonding agents, accelerators, or retardants in the mortar.
				2. Follow manufacturer recommendations for preparation, mixing, installation, finishing, etc.
			2. Preparation For Stone Patching Repairs:
				1. Clean area to be repaired with clean water and bristle brush to remove loose stone particles.
				2. Neutralize any salt deposits (efflorescence) with distilled water.
				3. Remove 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 inch (13 mm) of the substrate to ensure the surface to be repaired is solid and stable. Remove any sealant residue.
				4. 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.
				5. Cut edges of repair area to provide a minimum depth of 1/4 inch (6 mm). The edges of the repair should be square cut. Do not allow feathered edges in the repair area.

Patches less than 1/4 inch (6 mm) Deep: Use US Heritage Group HL15.

* + - * 1. Install mechanical anchors in repair areas if specified on the Contract Drawing or as otherwise directed by the Architect.
				2. Clean dust from surface and pores of substrate. Use clean water and scrub brush.
				3. Pre-wet substrate ahead of time to prevent 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 surface is glistening with no standing water.
			1. Mixing Mortar for Repair: A dust mask should be worn during mixing.
				1. Do not mix more material than can be used within 60 minutes. Discard mixed material that has been unused for 60 minutes or more.
				2. 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.

* + - * 1. Skim Coat: For 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.

* + - * 1. 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.

* + 1. DHL-IM Dispersed Lime Injection Stone Repair Execution:
			1. Workmanship:
				1. Do not use additives, such as bonding agents, accelerators, or retardants in the material.
				2. Submit samples of masonry prior to ordering material to ensure proper color matching.
				3. Follow manufacturer recommendations for preparation, mixing, installation, finishing, etc.
			2. Preparation For Stone Patching Repairs:
				1. Keep materials from staining adjacent intact masonry surfaces.
				2. Clean dust from substrate surface and pores. Use clean water and scrub brush.
				3. Flush out crack with clean water to remove small particles.
				4. Pre-wet stone with distilled water to prevent substrate from drawing moisture out of the repair too quickly.
			3. Mixing Mortar for Repair:
				1. No mixing is required. Material may have settled during storage and shipping.

Shake container prior to use to ensure full distribution of lime particulate within the mix.

* + - * 1. DHL-IM may be diluted with distilled water up to 5 percent by weight to penetrate smaller cracks and voids.
		1. IG10 Natural Injection Grout Stone Repair Execution:
			1. Workmanship:
				1. Epoxy, additives, acrylic bonding agents, accelerators, or retardants:

Not permitted in material.

Not permitted on wall face or individual masonry unit surface.

* + - * 1. Keep 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.

* + - * 1. Follow manufacturer recommendations for preparation, installation, finishing, etc.
				2. Mixing of individual ingredients at the job site is not permitted.
			1. Preparation For Stone Patching Repairs:
				1. Keep materials from staining adjacent intact masonry surfaces.
				2. Cut away loose and deteriorated material at the injection site.

Clean area to be repaired with clean water and a natural bristle brush to remove loose particles.

Flush out crack with water to remove debris.

Neutralize any salts (efflorescence) with distilled water, etc.

* + - * 1. Pre-wet substrate ahead of time to prevent 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.

* + - * 1. Set the appropriate injection ports.
			1. Mixing Mortar for Repair: A dust mask should be worn during mixing.
				1. Do not mix more material than can be used within 10 minutes.

Discard mixed material that has been unused for 30 minutes or more.

* + - * 1. 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.

* + - * 1. Temperature and humidity will affect the amount of water required to achieve the desired consistency.
	1. INSTALLATION
		1. Install Work in accordance with State and local Municipality standards.

\*\* NOTE TO SPECIFIER \*\* Masonry mortaring and grouting. Delete if not required.

* + 1. Install mortar in accordance with specification and US Heritage Group Installation Guidelines and Procedures for Lime Putty and Hydraulic Lime Mortars for Repointing Applications.

\*\* NOTE TO SPECIFIER \*\* Maintenance of Masonry. Delete options not required.

* + 1. Rebuilding:
			1. Cut out damaged and deteriorated (spalled, fractured, etc.) masonry with care in manner to prevent damage to adjacent remaining materials.
			2. Shore or support structure in advance of cutting out units to maintain stability of remaining materials.
				1. Cut away loose or unsound adjoining masonry and mortar to provide firm and solid bearing for new work.
				2. Cut out full units from joint to joint and in a manner to permit the replacement of full size units.
			3. Build in reclaimed masonry units following procedures for new work as specified in this specification.
			4. Mortar Mix: As specified in this specification.
			5. Ensure anchors, ties, reinforcing, stone cramps and dowels, and flashings are correctly located and built in.
			6. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line.
				1. Build in openings, accessories, and fittings.
			7. Re-use masonry to the fullest extent possible. Integrate new replacement masonry in concealed areas or shielded from public view.
			8. Brick Matching: New brick units to be solid, no voids, consisting of salvaged historic matching material.
			9. Stone Matching: New stone \_\_\_\_\_\_\_\_, if any, select to match the general field color of adjacent units as viewed from a 5' distance.
			10. Build new masonry to the full thickness as shown on drawings. Key brick or stone into existing structure wherever possible, providing mortar as required.
		2. Repointing:
			1. Leave initial mock-ups of stone and brick repointing in place throughout entire project to serve as control samples.
			2. Mortar for stone repointing and brick repointing will be two different compositions.
				1. This to be confirmed through mortar evaluation and laboratory testing.
			3. Leave one intact and serviceable example of each type of original mortar on the building; location and size to be determined with Architect.
			4. All joints (unless otherwise noted) to be raked back to sound, solid, back up material. All raking out should leave a clean, square face at back of joint to provide for maximum contact of pointing mortar with masonry back up mortar.
			5. Shallow or feather edging is not permitted.
			6. Existing mortar joints to be raked out the lesser of either a minimum depth of 2.5 times the width of the existing mortar joints or half the depth of the masonry unit so as not to compromise the structural stability of the wall.
			7. Examples:
				1. Mortar joint 1/16 inch (1.5 mm) Mortar joint needs to be cut out to a depth of 3/16 inch (5 mm) minimum.
				2. Mortar joint 1/8 inch (3 mm) needs to be cut out to a depth of 5/16 inch (8 mm) minimum.
				3. Mortar joint 1/4 inch (6 mm) needs to be cut out to a depth of 5/8 inch (16 mm) minimum.
				4. Mortar joint 1/2 inch (13 mm) needs to be cut out to a depth of 1-1/4 inch (32 mm) minimum.
				5. Mortar joint 3/4 inch (76 mm) needs to be cut out to a depth of 1-7/8 inch (48 mm) minimum.
				6. Mortar joint 1 inch (25 mm) needs to be cut out to a depth of 2-1/2 inch ( mm) minimum.
			8. Do not damage masonry units.
			9. Do not widen existing masonry joints. The surrounding masonry edges are not to be spalled or chipped in the process of mortar removal. Damage to surrounding stone resulting from rotary blade over running is not permitted. Contractor must replace masonry damaged during mortar removal with replacement units that match the original exactly.
			10. Utilize hand tools and power tools only after test cuts determine no damage to masonry units results.
			11. Vertical Joints (Head Joints): Must not be raked out using rotary power saws. Vertical head joints less than 5 inches (127 mm) in height must be removed by hand in stonework unless a demonstration can be made that rotary use can be implemented without over cutting the joint, i.e. "over running." Vertical joints exceeding 5 inches (127 mm) in height may be approved for cutting with rotary power saws pending a successful demonstration to the Architect.
			12. Horizontal Mortar Joints (Bed Joints) may be raked out using a diamond blade that is narrower than the joint width. The middle one-third of the mortar joint may be cut using a rotary power saw. The remaining mortar is to be removed from the masonry joints by hand using masonry chisels or pneumatic stone carving chisel. This technique is termed the Center Cut Approach.
			13. Skyward Facing Horizontal Joints: Finish skyward facing horizontal joints and seams between dissimilar masonry materials with Sonnolastic NP-1 elastomeric polyurethane sealant colored to match the project mortar.
			14. Brush, vacuum, blow out, or flush joints with water to remove dirt and loose debris, working from top to bottom of wall. Time the rinsing application so that at the time of pointing excess water has evaporated or run off. Joint surfaces should be damp but free from standing water.
			15. Exposed surface of masonry adjacent to joint shall be surface saturated dry prior to mortar installation. Time the water mist application so that at the time of pointing excess water has evaporated or run off. Joint surfaces should be damp but free from standing water.
			16. Maintain a water mister on site at all times during the repointing process.
			17. Walls should be pre-soaked with water 10 minutes prior to pointing.
			18. Mortar must be mixed according to manufacturer recommendations. Mortar material is to resemble the consistency of brown sugar during installation. This drier consistency enables the material to be tightly packed into the joint and allows for cleaner work and prevents shrinkage cracks as the mortar cures.
			19. Joints should be pointed in layers or "lifts" where the joints are deeper than 1-1/4 inch (31 mm). Apply in layers not greater than 1/2 the depth but not more than 1-1/4 inch (31 mm) or until a uniform depth is formed. Compact each layer thoroughly and allow it to become thumbprint hard before applying the next layer.
			20. Lift Examples:
				1. 3/16 inch (5 mm) joint depth (1/16 inch (1.5 mm) joint existing) point in one lift.
				2. 5/16 inch (8 mm) joint depth (1/8 inch (3 mm) joint existing) point in one lift.
				3. 5/8 inch (16 mm) joint depth (1/4 inch (6 mm) joint existing) point in one lift.
				4. 5/16 inch (8 mm) joint depth (3/8 inch (10 mm) joint existing) point in one lift.
				5. 1-1/4 inch (31 mm) joint depth (1/2 inch (13 mm) joint existing) point in one lift.
				6. 1-7/8 inch (48 mm) joint depth (3/4 inch (19 mm) joint existing) point in two lifts approximately 1 inch (25 mm) (each).
				7. 2-1/2 inch (64 mm) joint depth (1 inch (25 mm) joint existing) point in three lifts approximately 3/4 inch (19 mm) (each).
				8. Over 2-3/4 inch (70 mm) joint depth- point in lifts of no more than 1-1/4 inch (31 mm) (each).
			21. When mortar is thumbprint hard the joints shall be finished to match the original historic joint profile.

\*\* NOTE TO SPECIFIER \*\* Delete tooling profile types not required.

* + - * 1. Stone Joint Tooling Profile Type: \_\_\_\_\_\_\_\_\_.
				2. Face Brick Joint Tooling Profile Type: \_\_\_\_\_\_\_\_\_.
				3. Common Brick Joint Tooling Profile Type: \_\_\_\_\_\_\_\_\_.
				4. Terra Cotta Joint Tooling Profile Type: \_\_\_\_\_\_\_\_\_.
				5. Historic Concrete Masonry Units Joint Tooling Profile Type: \_\_\_\_\_\_\_\_\_.
				6. Confirm with Architect once scaffold is erect and direct inspection of protected areas is possible.
		1. Curing Methods:
			1. Prevent finished mortar from drying out too quickly. Protect wall from direct sun and high winds during drying period.
				1. If mortar binder contains only lime putty (without hydraulic lime or Portland cement) then the wall must be misted to a surface saturated dry condition nine (9) separate times allowing the wall to dry out between applications.

Completion of nine (9) wet-and-dry cycles may take two days to one week depending on the conditions of the wall and the environment. Cover the repointed wall with burlap sheeting as necessary to slow drying between misting applications.

* + - * 1. If mortar contains natural hydraulic lime or Portland cement, then maintain damp mortar condition for the first 72 hours after installation. Cover the repointed wall with plastic sheeting mist as necessary to prevent drying between misting applications.
			1. Acceptable misting methods include, periodic hand misting, and periodic mist spraying using a system of pipes, mist heads, and timers. Adjust misting methods to ensure that the pointing mortar is damp without eroding the surface of the mortar.
	1. INSTALLATION FOR STONE ASSEMBLY MAINTENANCE
		1. HL60 Heritage Limestone Patching Repair Mortar Execution.
			1. Application of Repair Material:
				1. Skim Coat: Pre-wet stone surface, so it is glistening wet, with no standing water. Remove loose material stone and wash down the stone a second time.
				2. Installation of non-corrosive screws and wires when stone repair exceeds 4 inches (102 mm) in thickness is recommended.
				3. Use trowels and plaster detailing tools to apply the skim coat to small areas.
				4. Make sure the skim coat adheres to all surfaces of the repair area of the stone.
				5. Check the skim coat after 5 minutes.
				6. Do not allow skim coat surface to dry completely.

If it does dry out, moisten surface with clean water.

Drying time is affected by weather conditions. Monitoring is critical.

* + - * 1. Additional Coats: Scoop wet mix from the mixing container by hand (wear latex gloves) or with a small trowel.

Apply wet mix by pressing and rubbing it into the skim coat.

Fill pores and voids of the stone. Repair mortar may be built up to a 3 inches (76 mm) in one lift.

Finger test each coat before applying the next.

If 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.

* + - 1. Finishing Techniques:
				1. Surface of repair may be tooled or scraped to required finish.

You may finish the same day or wait until the following day.

For soft edges, carve 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.

Timing for finishing and actual cure times are completely reliant on air temperatures and relative humidity. Monitor site conditions closely.

* + - 1. Curing Procedure:
				1. Keep repair area, plus an additional 2 inches (51 mm) surrounding repair area damp for a minimum of 36 hours.

Spray mist repair area with clean water, covering with plastic sheeting to keep repair area damp.

Adjust curing methods to prevent repair from drying out too quickly.

* + - * 1. Curing methods 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 must take into account how much time is remaining before freezing weather arrives.

* + 1. DHL-IM Dispersed Lime Injection Stone Repair Execution.
			1. Application of Repair Material:
				1. Install material by means of a packer or injection tool after pre-wetting with distilled water. Typical syringe size 0.08-0.25 mm.
				2. Diluted material may be brush applied to very fine cracks.
				3. DHL-IM has no working time, use immediately.
				4. To prevent drying, unused material should remain in a closed container.
			2. Curing Procedure:
				1. Air and Object Temperature Range: 42 to 120 degrees F (5.5 to 48.9 degrees C). Typical Curing Time: 48 hours. Full cure time is dependent on temperature and relative humidity.
		2. IG10 Natural Injection Grout Stone Repair Execution:
			1. Application of Repair Material:
				1. Follow manufacturers required directions.
				2. Inject cracks from 1/16 inch (1.5 mm) up to 1/4 inch (6 mm) wide only.
				3. Inject crack fully.
				4. Cap cracks and seal injection ports with appropriate stone repair mortar.
				5. Finish to match the adjacent stone surfaces.
			2. Finishing Techniques:
				1. Heavily Rusticated (Rock Face) Masonry Surfaces: Finish crack area with stone patching mortar tooled to match adjacent stone surfaces.
				2. 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.
			3. Curing Procedure:
				1. Curing methods will vary in different parts of the country and at different times of the year. Covering surface with tarps or damp cloths may be required in very dry or hot environments to protect surfaces from rapid curing.
	1. FIELD QUALITY CONTROL
		1. Testing Frequency: One set of specified tests for every 5,000 sf (465 sq m) of completed wall area.
		2. Testing of Mortar Mix: In accordance with ASTM C780.
	2. CLEANING
		1. Section 01 70 00 - Execution and Closeout Requirements.
		2. As work proceeds and on completion, remove excess mortar, smears, droppings using mechanical means and water only immediately after initial drying of mortar. Chemical after washing of the building should not be necessary.
		3. Clean surrounding surfaces.
		4. Maintenance of Stone Assemblies. Delete if not required.
		5. Remove mortar from tools and mixing equipment with water immediately after use. Repair mortar is difficult to remove after it has set.
	3. REPAIR OF MASONRY
		1. Remove existing exposed metal anchors and fasteners no longer necessary. Fill holes at match adjacent surface color and texture.

END OF SECTION