Historic Preservation
Masonry Repointing Procedures

Hiring a Mason:
All repointing work should be performed by a firm with not less than five years' satisfactory experience performing masonry work, and at least three (3) prior projects performing repointing work on historic buildings or structures. Require the contractor to provide a list of completed projects, and written agreement to follow these specifications.

Project Scope:
Examine mortar joints to determine which joints require repointing. Joints that are cracked, deteriorated, eroded, contain voids, or are poorly bonded to masonry should be repointed.

All historic repointing projects should conform to ASTM Standard Guide for Repointing Historic Masonry, E2260-03.

Project Conditions:
Do not repoint mortar joints or repair masonry unless air temperatures are between 40 to 95 degrees Fahrenheit and will remain so for at least 48 hours after completion of work.

Prevent mortar used in repointing and repair work from staining surface of surrounding masonry and other surfaces. Immediately remove mortar in contact with exposed masonry and other surfaces.

Protect sills, ledges, and projections from mortar droppings.

Sequencing/Scheduling:
Perform masonry restoration in the following sequence:

1. Rake out existing mortar from joints indicated to be repointed to a minimum depth of 2 to 2-1/2 times the width of the joint (for most joints, this will approximately 1 inch). Remove mortar using hand tools only. Remove cleanly, leaving square corners at back of the cut. Do NOT use electric or pneumatic chisels. Do not spall or chip masonry. Any damaged masonry must be repaired.
2. Clean joints with water rise with maximum 100-psi pressure. Masonry joint should be damp but without standing water.
3. Mix mortar carefully, measuring and mixing carefully to assure visual and physical characteristics. Dry ingredients should be measured and volume and be thoroughly mixed before the addition of any water (more information on mix below).
4. Perform field test of new repointing work on masonry (a 3' x 3' area on the least visible masonry facade). Contact City Historic Preservation Office for approval of field test prior to continuing with work. This field visit should occur at least 72 hours after the field test is performed to ensure that the repointing areas have cured. See additional information below.
5. Repoint existing mortar joints for remainder of structure or building, or as specified by project. (See additional information below).
6. Clean existing masonry surfaces after repointing work is completed. Clean mortar from masonry face promptly to prevent staining. If necessary after 24 hours of set time, scrub and wash surface to remove laitance using water and detergent, but no chemicals. Use natural sponges and bristle brushes. Do not use wire brushes.

For more information or for a copy of this publication in an alternate format, contact Planning & Development at 602-262-7811 Voice or TTY use 7-1-1.

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Mortar Materials:
CEMENT: ASTM C 150, Type II, white, non-staining unless it can be established that the original mortar used grey cement. For stonework and other masonry indicated, provide non-staining white cement complying with staining requirement of ASTM C91 for not more than 0.03% water-soluble alkali.

HYDRATED LIME: ASTM C 207, Type S or SA, Hydrated Lime for Masonry Purposes. This is high plasticity lime (not air entrained) instead of quicklime.

AGGREGATE: ASTM C 144, unless otherwise indicated.

SAND: Use **natural** rounded sand, clean, sound and washed. Provide sands that will produce final mortar color and texture to match the existing, and with aggregate type and grading similar to existing mortar. The color of the sand shall be the primary factor used to make mortars that match original. Sand should generally meet ASTM C 144, although sieving the sand may be needed to match the historic particle appearance and gradation.

WATER: Clean, free of oils, acids, alkalis, and organic matter. No antifreeze compounds or other admixture shall be used.

PIGMENTS: Pigments may be needed for red or black mortar. Pigments should not exceed 10 percent by weight of the Portland cement in the mix, and carbon black should be limited to no more than 2 percent.

CHEMICALS: No modern chemical additives should be used.

Mortar Analysis:
A visual analysis of the masonry is important to understand the mortar mix, proportions, and removal and application techniques needed. For buildings of high historic significance, a mortar analysis by a qualified laboratory is recommended.

Mortar Mixes:
PRE-BLENDED MORTAR MIXES: Pre-blended masonry cement/mortar mix should not be used since it is designed to produce mortars with compressive strength beyond what is common on most historic mortars.

PRE-BLENDED LIME MORTAR: Pre-blended lime mortars are also not recommended in most cases since the mortar will often not be an exact match to historic mortar. Pre-blended lime mortar should never be used for “spot repointing” projects. If for complete repointing projects, the Historic Preservation Office confirms through a test panel that the pre-blended lime mortar is very close to color, composition and texture to historic mortar then it may be permissible. However, in no circumstances shall the mortar differ from the mortar proportions requirements specified below.

MEASUREMENT AND MIXING: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel, use known measure, mix materials in a clean mechanical batch mixer.

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

ADMIXTURES: Do not use admixtures of any kind in mortar.

TOOLS: Use a pointing tool sized and shaped to the proper width for the joint being pointed. Match the profile and tooling of the existing joints exactly. Apply mortar using wooden trowel to simulate the original mortar coating.

Mortar Proportions:
SPECIFICATIONS: NEW MORTAR MUST MATCH ORIGINAL IN COLOR, COMPOSITION, TEXTURE AND TOOLING. New mortar must have greater vapor permeability and be softer than masonry units. It should also be as vapor permeable and at least as soft as the historic mortar (not harder).

The original mortar should be carefully analyzed by a person trained in this field. A preservation architect is highly preferred to help determine the appropriate proportions in advance of the project. In all cases, there should be a site visit with the contractor and Historic Preservation Office to perform a visual analysis of the mortar prior to the initiation of the project.

MIX PROPORTIONS BELOW ARE ONLY EXAMPLES AND MUST BE REVISED TO SUIT PROJECT REQUIREMENTS ONCE EXISTING MORTAR HAS BEEN ANALYZED.

For buildings dating from 1930 or earlier:
The final mortar mix shall have no more than 25% of total volume of the lime and Portland cement – combined – consisting of Portland cement unless testing of historic mortar demonstrates a higher Portland cement content. Generally, the proportions fall within ASTM Type K to L range. The range of acceptable mortar proportions is below:

1/10 part white Portland cement	TO	1 part white Portland cement
3 parts lime		4 parts lime
12 parts natural sand		15 parts natural sand
Water		Water

For buildings post 1930:
For these buildings, a higher content of Portland cement than that specified above would be appropriate if the visual and/or laboratory analysis reveals a higher proportion of Portland cement. In almost all cases, the mortar would be in the Type N to Type L range.

Test Sample:
Prepare one test sample at inconspicuous location. Test sample shall be approximately nine square feet in size and let cure at least 72 hours. Protect test sample from dirt and moisture. Contact the City Historic Preservation Office to review the test sample once sample has cured and only proceed with project once City Historic Preservation Office approval is obtained.