

**PROGRAM COMMENT FOR DEPARTMENT OF DEFENSE
REHABILITATION TREATMENT MEASURES**

APPENDIX 1

SECTION 04100.01

REMOVAL OF MORTAR JOINTS AND REPOINTING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. This specification provides procedures appropriate for removing mortar and repointing historic masonry.
- B. This specification has been developed for use on historic properties (defined as any district, site, building, structure, or object that is listed in or eligible for listing in the National Register of Historic Places) and provides an overview of accepted practices.
- C. All work described herein and related work must conform to the Secretary of the Interior's Standards for the Treatment of Historic Properties.
- D. The Contractor shall provide all labor, materials, equipment, and operations required to complete the rehabilitation work indicated herein.
- E. All work described herein and related work must have the approval of a Cultural Resources Manager, Conservator, Historic Architect, or other professional who meets the standards outlined in the Secretary of the Interior's Standards – Professional Qualifications Standards pursuant to 36 CFR 61. Such person is referred to in this document as the *Architect*.
- F. Site-specific specifications, when appropriate, will be provided by the Architect.

1.02 SECTION INCLUDES

- A. Removal of mortar joints
- B. Repointing

1.03 RELATED SECTIONS

- A. Section – 04100.02 Preparation of Lime and Cement-Amended Mortars
- B. Section – 04211 Historic Brick (pending issuance)
- C. Section – 04214 Terra Cotta and Ceramics (pending issuance)
- D. Section – 04500 Masonry Restoration (pending issuance)
- E. Section – 04720 Historic Cast Stone (pending issuance)

1.04 REFERENCES

- A. Repointing shall conform to *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*, available at the National Park Service (NPS) website at <http://www.nps.gov/history/hps/tps/standards_guidelines.htm>.
- B. Techniques employed for repointing shall be as outlined in *Preservation Brief No. 2: Repointing Masonry Joints in Historic Masonry Buildings*, available online at the NPS website at <<http://www.nps.gov/history/hps/tps/briefs/brief02.htm>>.
- C. Techniques employed for cleaning masonry prior to repointing shall be as outlined in Preservation Brief #1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings.
- D. U.S. General Services Administration Historic Preservation Technical Procedures for mortar, available online at <http://www.gsa.gov/gsa/cm_attachments/GSA_DOCUMENT/Preservation_Note_01_R2RQ4-y_0Z5RDZ-i34K-pR.doc>; <<http://w3.gsa.gov/web/p/hptp.nsf/a533f1f859737bc9852565cc0058d0b6/7de342045d4c63f6852565c50054b3a7?OpenDocument>>; and <<http://w3.gsa.gov/web/p/hptp.nsf/a533f1f859737bc9852565cc0058d0b6/e7518da3d776f026852565c50054b3c5?OpenDocument>>.
- E. Masonry restoration work shall comply with ACI / ASCE 530.1-88. Contractor shall maintain at least one copy of ACI / ASCE 530.1-88 on site.

1.05 SUBMITTALS

The Contractor will submit a detailed schedule of the areas to be repointed, including an assessment of the problem areas and a detailed procedure for repointing, to the Architect for approval. Documentation shall include:

- 1. Existing general masonry failures that contribute mortar losses shall be noted and should be scheduled for repair prior to repointing.
- 2. Analysis of mortar type and color shall be conducted, the extent and type of analysis to be determined by the Architect.
- 3. 'Before' photo documentation of areas to be worked.

1.06 QUALITY ASSURANCE

- A. Work Experience: The Contractor & masons to perform the work in this section shall have demonstrated experience in the repointing of historic masonry, ideally a minimum of five (5) years . He/she shall demonstrate a working knowledge of the Secretary of the Interior's Standards for Guidelines for Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings.
- B. Mortar removal will be undertaken by an experienced mason. The mason operating mechanical tools or power tools (when necessary) shall have demonstrated proficiency with the tools which must be approved by the Architect. The Mason/operator using the equipment must have demonstrated expertise in their proper use on historic structures, ideally a minimum of five years experience.

1.07 MOCK-UPS

- A. The Contractor shall prepare mock-up installations prepared with each of the removal methods and tools that will be used for this Work at locations selected by the Architect. Test panels should not be undertaken in areas that are highly visible. Use of power and mechanical tools shall be approved by the Architect.
- B. The Contractor shall prepare two mock-up installations of each type of masonry joint style and mortar color to be installed at locations selected by the Architect. If cleaning tests are also to take place, test panels should be placed in the same area. Test panels should not be undertaken in areas that are highly visible. Each test panel shall be executed in the same manner as the final installation. Mock-ups will be reviewed after the mortar removal and again after completion of repointing. Test panels shall be a minimum area 3x3 feet for brick facades, and larger for stone facades. Test panels will be inspected for color, texture, and installation technique.
- C. If the first mock ups are unacceptable, the Contractor shall prepare up to three additional mock-ups of each mortar, joint type, and mortar color without further compensation, for approval by the Architect. Approved test area(s) shall become part of the work and shall serve as the quality standard for all subsequent work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered to the site in original packaging, unopened, with manufacturer's name and product identification thereon. Cementitious materials shall be protected from contamination by foreign matter and deterioration by moisture or temperature. Contaminated or deteriorated material shall not be used.
- B. Masonry materials shall be stored in such a manner as not to interfere with the operation and daily maintenance of the facility. Proposed storage locations shall be approved by the the government prior to the delivery of materials. Masonry materials shall not be stored inside the building.

1.09 PROJECT / SITE CONDITIONS

- A. The normal temperature range for the work of this Section shall be when the air and surface temperatures are 40 degrees F and rising, or less than 90 degrees F and falling. When temperatures are expected to fall outside this range, the Contractor shall employ hot and cold weather procedures as published by the Masonry Institute of America, when approved by the Architect.
- B. The Contractor is responsible for protecting existing adjacent materials and surfaces during the execution of the work, and shall provide all necessary protection and follow all necessary work procedures to avoid damage to existing material assemblies not a part of the work in the Section.
- C. The Contractor shall provide visible barriers and / or warning tape around the perimeter of the work area for visitor protection and shall also provide that nearby vehicles and adjacent structures and foliage will be protected from damage during the course of the work.

- D. The Contractor shall coordinate masonry repointing with the other trades involved in exterior and interior rehabilitation work, as applicable, including but not limited to masonry cleaning, sealing, and painting.

PART 2 – PRODUCTS

2.01 EQUIPMENT FOR RAKING AND REPOINTING

- A. Equipment for raking joints:
 - 1. Preferred Method: Hand chisels and mash hammers
 - 2. Alternate Method: With Architect’s approval: Power tools including small pneumatically-powered chisels, scaler (power chipper), and thin diamond-bladed grinders. Power saws are not generally recommended.
- B. Equipment for repointing:
 - 1. Mortar pan mill or equipment for mortar mixing
 - 2. Plastic buckets, hoe, wooden mallet
 - 3. Mortar board, hawk, trowels, pointing rod
 - 4. Natural bristle or nylon brushes (metal bristle brushes are NOT to be used)

2.02 MORTAR SELECTION CRITERIA: See Sections 04100.02 and 04400.01.

- A. Repair mortar shall match as closely as possible the characteristics of the historic pointing mortar.
- B. Repair mortar shall match the color, texture, strength and tooling of the historic pointing.
- C. Sand shall match the sand of the historic mortar, when possible
- D. Mortar shall have greater vapor permeability and be softer, measured in compressive strength, than the masonry units.
- E. Mortar shall be as vapor permeable and be as soft or softer, measured in compressive strength, than the existing historic mortar.

PART 3 - EXECUTION

3.01 GENERAL

- A. The restoration methods and materials selected for a specific structure shall take into account the total construction system of the building to be worked upon, including different masonry and mortar materials, as well as non-masonry elements that may be affected by the work.
- B. The extent of the repointing, whether partial or sectional repointing, complete facades or features, or total structure or building, shall be reviewed by the Architect on site prior to

beginning operations. The Contractor shall submit a repointing schedule, including methods and materials to be used for approval before work starts.

- C. Prior to commencing the work, the Contractor shall complete a schedule to be approved by the Architect of the proposed work, to address the condition of the mortar and masonry.
- D. The Contractor shall protect adjacent materials, installed non-masonry materials, and openings.
- E. Manufacturer's instructions for mixing mortar and installation of masonry and equipment shall be followed. Masonry shall conform to ASTM C270 - 07a Standard Specification for Mortar for Unit Masonry
- F. Masonry cleaning shall be completed prior to beginning raking and repointing work. Cleaning shall be in accordance with the Secretary's Standards and in conformance with National Park Service, Technical Preservation Services Preservation Brief #1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings.

3.02 SYSTEM FOR JOINT REMOVAL

- A. The areas selected for repointing, if partial or selective repointing is to be done, shall be designated and marked off with an impermanent material.
- B. Removal Methods:
 - 1. Preferred Method: removal of mortar by hand with a hand chisel and mash hammer. This method produces the least damage and is preferred for masonry with thin joints and for brick.
 - 2. Alternative Method #1: removal with power tools such as pneumatic chisels and grinders. Power saws are not recommended for use on most brick walls or thin joints. Small pneumatically powered chisels are generally effective for use on historic buildings, providing the operator is skilled. Grinders with thin diamond blades can be used for horizontal joints on hard portland cement mortars.
 - 3. Alternative Method #2: combined use of power tools and hand chiseling methods are generally recommended and achieve the highest degree of success when properly executed.
- C. Specifications for Removal:
 - 1. Mortar shall be removed to a minimum depth of 2 to 2 ½ times the width of the joint but not less than ¾ inch.
 - 2. Chisels and power tools are to be the appropriate size to fit cleanly into mortar joints without damage to surrounding surfaces.
 - 3. Loose or disintegrated mortar beyond the minimum depth shall be removed.
 - 4. Removal of the mortar shall be done in a manner that does not score, chip, or otherwise damage masonry units or adjacent elements.

5. Mortar should be removed cleanly from the masonry units, leaving square corners at the back of the cut.
6. If using a grinder to rake head joints, the Contractor shall switch to the smallest diameter blade possible to make the deepest cut without overrunning the ends of the joint and cutting into the material above or below. Top and bottom of the head joints shall be finished with a chisel.
7. Use a hand chisel to finish joints adjacent to door and window openings to avoid damage to frames and trim.
8. If work is found unacceptable by the Architect, all raking shall cease without additional cost to the Owner until deficiencies in tools, workmanship, or methodology have been corrected to the Architect's satisfaction.

3.03 SYSTEM FOR REPOINTING

- A. The Contractor shall inspect all joints to receive mortar prior to commencing work:
 1. After removal of the old mortar, joints shall be blown clean with compressed air (40-60 psi) to remove all loose particles and dust.
 2. Prior to repointing, joints shall be dampened with pressurized water (100-150 psi). Joints shall be damp with no visible standing water.
 3. Dampen absorbent masonry surfaces, such as limestone, sandstone, and common brick, to which mortar will adhere.
- B. Filling Joints:
 1. Fill the deeper areas first, compacting the new mortar in several successive layers.
 2. Apply successive amounts of mortar in ¼-inch layers.
 3. Allow each layer to harden before application of the next layer.
 4. Apply the final layer flush with masonry units, except where old bricks or stones have worn, rounded edges, the final mortar layer should be recessed slightly from the face of the masonry. Do not feather-edge mortar over chipped or damaged edges.
- C. Finishing:
 1. Allow the final layer to set until "thumb-print hard" and tool to match the historic joint. Proper timing is important for uniform color and appearance of the mortar.
 2. Remove excess mortar from the edges of the joints with a natural bristle or nylon brush after mortar has dried but before the mortar is initially set (approximately 1-2 hours).
- D. Curing:

1. Periodically wet mortar joints after the mortar joints are thumb-print hard and have been tooled (especially important with high-lime content mortars, such as Type O, Type K, and especially Type L). Misting with a hand sprayer with a fine nozzle for one to two days is recommended.
2. Where ambient temperatures exceed 80 degrees F or where wind speeds exceed 20 mph, cover walls with burlap after repointing to keep walls damp and protected from direct sunlight. If plastic is used, it must be tented out and not placed directly against the wall.
3. Allow new mortar to cure for at least 30 days prior to exposure to other repairs.

3.04 FINAL REPORT

The Contractor and Architect shall:

- A. Revisit the site after the new mortar has cured at least 30 days to compare the finish and color of the repair to see if the desired affect has been achieved.
- B. Document the work and finished product with photographs, both 'before' and 'after'.
- C. Provide a written summary of the project and results upon final inspection and approval. The summary shall outline steps taken or new findings not specified in the initial documentation.

END OF SECTION