

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

APPENDIX 3

SECTION 04110.01

PREPARATION OF LIME- OR PORTLAND-BASED STUCCO

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This specification provides procedures appropriate for preparing lime or Portland based stucco for repair and maintenance of historic buildings.
- 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. Selecting the appropriate stucco
- B. Preparation of lime-based stucco
- C. Preparation of portland cement-based stucco

1.03 RELATED SECTIONS

- A. 04110.02 – Repair of Historic Stucco
- B. 04510.01 – Cleaning and Testing of Atmospheric Soiling, Graffiti, Stains, and Biogrowth (issuance pending)
- C. 07100.01 – Water Repellent Properties and Application (issuance pending)
- D. 09910.01 – Surface Preparation and Repainting of on Masonry (issuance pending)

1.04 REFERENCES

- A. *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. *Preservation Brief No. 22: The Preservation and Repair of Historic Stucco* available online at NPS website at <<http://www.nps.gov/history/hps/tps/briefs/brief22.htm>>.
- C. Conway, Brian D. *Illinois Preservation Series Number 2: Stucco*. Springfield, Illinois: Illinois Department of Conservation, Division of Historic Sites, 1980.
- D. Portland Cement Plaster (Stucco) Manual. Skokie, Illinois: Portland Cement Association, 1980.
- E. Vieux Carre Masonry Maintenance Guidelines. Revised from the initial report prepared by Mary L. Oehrlein in 1977. New Orleans, Louisiana: Vieux Carre Commission, 1980.
- F. ASTM C 207 Standard Specification for Hydrated Lime for Masonry Purposes.
- G. ASTM C 144 Standard Specification for Aggregate for Masonry Mortar.
- H. ASTM C 150 Standard Specification for Portland Cement.
- I. ASTM C 1328 Standard Specification for Plastic (Stucco) Cement.
- J. ASTM C 979 Specification for Pigments for Integrally Pigmented Concrete.
- K. ASTM C 926 Standard Specification for Application of Portland Cement-Based Plaster
- L. ASTM C 1489 Standard Specification for Lime Putty for Structural Purposes

1.05 SUBMITTALS

- A. The Contractor shall submit a detailed schedule of the areas of stucco to be patched and new areas to be installed, including an assessment of the problem areas, a historic stucco analysis, and detailed procedures for preparation and stucco application, to the Architect for approval:
 - 1. Submit data indicating proportion or property specifications used for stucco.
 - 2. Submit test reports for mortar materials and report proportions resulting from laboratory testing used to select stucco mix.
- B. Product Literature. The Contractor shall submit manufacturer's product literature to Architect for all proprietary products specified for stucco preparation. Product literature shall include specification data, Material Safety Data Sheets, and instructions for storage, handling, and use.
- C. Historic stucco analysis. The Contractor shall submit the laboratory report from completed stucco analysis. Stucco analysis shall be completed prior to beginning test panel preparation. Analysis shall be limited to wet chemical and microscopic analysis to

characterize the insoluble aggregate, determine binder-aggregate ratio, prepare a mix design for replacement stucco, and identify appropriate sources for sand aggregate.

- D. Samples. No stucco restoration work shall proceed until all samples are approved. The Contractor shall submit samples of the following stucco repair and replacement materials for approval of color and texture match:

Cured stucco samples: Prepare portable samples approximately 6x6 inches. Once a matching stucco color is approved by the Architect, placement of on-site mock-ups may begin.

1.06 QUALITY ASSURANCE

- A. Work Experience: The Contractor and masons to perform the work in this section shall have a demonstrated experience with historic stucco and mortars, ideally a minimum of ten (10) 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. Warranty: The Contractor shall provide a warranty in writing against defects in material and installation for a period of five (5) years.
- C. The Contractor shall not change sources or manufacturers of mortar materials during the course of the work.

1.07 MOCK-UPS

- A. After the Architect approves a stucco color from the cured stucco samples, the Contractor shall prepare two mock-up installations of each type of stucco to be installed at locations selected by the Architect. If cleaning tests are also to take place, test panels should be in the same areas. 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. Test panels shall have a minimum area of 3x3 feet. Test panels will be inspected for color, texture, and installation technique and must be approved by the Architect.
- B. If the initial mock-ups are unacceptable to the Architect, the Contractor shall prepare up to three additional mock-ups of each stucco without further compensation. 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. The Contractor shall be deliver all products to the site in original packaging, unopened, and undamaged, with manufacture's name and product identification visible thereon, and manufacturer's instructions and Material Safety Data Sheets.
- B. The Contractor shall store all products in a dry location and protect them from dampness and freezing following manufacturer's instructions.
- C. The Contractor shall stockpile and handle all aggregates in a manner that prevents contamination from foreign materials.

1.09 PROJECT / SITE CONDITIONS

- A. Normal conditions for the work of this Section shall be defined as when the air and surface temperatures are 40 degrees F and rising or less than 90 degrees F and falling. When temperatures are predicted to rise above or fall below this temperature range, the Contractor shall implement hot or cold weather procedures as defined by the Masonry Institute of America.
- B. Work shall not commence when rain, snow or below-freezing temperatures are expected within the next 24 hours. All surfaces shall be free of standing water, frost, and ice.
- C. The Contractor is responsible for protecting existing adjacent materials and surfaces, and substrate 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.
- D. 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 shall be protected from damage during the course of the work.
- E. The Contractor shall coordinate stucco work with the other trades involved in exterior and interior rehabilitation work, including but not limited to masonry cleaning, sealing, and painting.

PART 2 - PRODUCTS

2.01 EVALUATION OF EXISTING STUCCO

- A. Microscopical and chemical analysis of historic stucco.
- B. Visual inspection, conditions assessment, and documentation.

2.02 LIME STUCCO

The type of substrate must be identified (see Section 04400.01, Identifying Masonry Types and Failures). The chosen stucco composition must be compatible in color, texture, finish, and strength with the existing stucco and substrate.

- A. Lime Based Stucco
 - 1. Lime should conform to ASTM C 207, Type S, Hydrated Lime for Masonry Purposes: 1,800 psi.
 - 2. Lime putty should conform to ASTM C 1489.
 - 3. Sand should match the sand in the existing stucco as closely as possible in color, texture, and gradation, should be free from impurities, and should conform to ASTM C 144.
 - 4. Water should be clean and potable.

5. As appropriate, hair or fiber (if used) could be goat, horse, or cattle hair, or pure manilla fiber of good quality, ½ to 2 inches in length, clean and free of dust, dirt, oil, grease, or other impurities.
 6. Colorants (if required for exact color match) should be non-fading, mineral oxide masonry pigment or earth pigments.
- B. Equipment: Trough, wheelbarrow, plastic buckets, hoe, hawk, trowel, burlap (clean, undyed, and unprinted).

2.03 PORTLAND CEMENT AND PORTLAND CEMENT-AMENDED STUCCO

The type of substrate must be identified (see Section 04400.01, Identifying Masonry Types and Failures). The chosen stucco composition must be compatible in color, texture, finish, and quality with the existing stucco and substrate.

- A. Portland cement and Portland cement-amended stucco
1. Lime should conform to ASTM C 207, Type S, Hydrated Lime for Masonry Purposes.
 2. Sand should match the existing stucco as closely as possible in color, texture and gradation; be free from impurities; and conform to ASTM C 144.
 3. Cement should be gray and/or white, non-staining Portland cement and conform to ASTM C 150, Type II. Gray and white cements may be combined as required to achieve the required color.
 4. Water should be clean and potable.
 5. Hair or fiber (if used) should be goat or cattle hair, or pure manila fiber of good quality, ½ to 2 inches in length, clean and free of dust, dirt, oil, grease, or other impurities.
 6. Pigment (if used) should be compatible with the stucco mix and conform to ASTM C 979.
- B. Equipment: Trough, wheelbarrow, plastic buckets, hoe, hawk, trowel, burlap (clean, undyed, and unprinted).

2.04 LIME AND CEMENT STUCCO MIXES

- A. General: Unless the historic stucco analysis recommends otherwise, comply with the requirements of ASTM C 926 for the proportioning of materials and the manner of mixing the plaster for each required application.
- B. Lime-Based Stucco
1. Scratch and brown coats:
 - 1 part lime putty
 - 3 parts sand
 - Approx. 6 pounds hair or fiber

2. Finish coat:
1 part lime putty
3 parts sand

C. Lime-Portland Cement Stucco

1. Type N:

Scratch and brown coats:

1 part hydrated lime
1 parts Portland cement
6 parts sand
Approx. 6 pounds hair or fiber
Water to form a workable mix

Finish coat:

1 part hydrated lime
1 parts Portland cement
6 parts sand
Water to form a workable mix

2. Type O:

Scratch and brown coats:

2 part hydrated lime
1 parts Portland cement
9 parts sand
Approx. 6 pounds hair or fiber
Water to form a workable mix

Finish coat:

2 part hydrated lime
1 parts Portland cement
9 parts sand
Water to form a workable mix

3. Portland cement stucco:

1 part Portland cement
2.5 parts sand
Hydrated lime to not more than 15% of the cement volume
Water to form a workable mix

2.05 PRE-MIXED STUCCO

With the Architect's approval, pre-mixed stucco may be used for patching and new stucco, provided it is compatible with the existing stucco and/or the masonry substrate. Provide manufacturer's full color range for selection or provide custom match. Follow manufacturer's recommended mixing and preparation procedures for factory-mixed products.

PART 3 - EXECUTION

3.01 GENERAL

- A. The extent of the stucco repair work and/or new areas to be stuccoed shall be approved by the Architect on site prior to beginning operations. The Contractor shall submit an annotated drawing or photographs showing the affected areas, along with a written description of the methods and materials to be used.
- B. The Contractor shall protect adjacent materials, openings, and substrate.

3.02 LIME BASED STUCCO

- A. Mix lime stucco thoroughly prior to use.
 - 1. Vertical shaft mixers should be used rather than drum-type mixers.
- B. Add sand and lime alternately to the mixer while it is running. Unless sand is extremely dry, water is most likely not needed. If the mixture is crumbly after 15 minutes of mixing, a small amount of water (about 8 fluid ounces at a time for a 15-gallon mixer load) may be added.
- C. Mix for a minimum of 20 minutes. Avoid locating the mixer in direct sunlight to minimize heating of the mortar. When thoroughly mixed, lime mortar should be fairly dry to the appearance, but spreadable. Wash all mixing equipment thoroughly when mixing is completed.
- D. Fiber may be added into the mortar in the last few minutes of mixing. Once fibers are well distributed, discontinue mixing.
- E. Mixed lime stucco may be stored for up to one month if it is tightly covered and mixed again before use. Un-fibered stucco can be mixed in advance and stored indefinitely in airtight containers with a 1" water barrier on top.

3.03 PORTLAND CEMENT AND PORTLAND CEMENT-AMENDED STUCCO

- A. Mix Portland cement and Portland cement-amended stuccoes in accordance with ASTM C 926 and the PCA Portland Cement Plaster Manual.
- B. Measure dry ingredients by volume or equivalent weight. Do not measure by shovel. Combine in a clean, mechanical batch mixer.
- C. For Portland cement stucco, mix dry ingredients thoroughly prior to adding water.
- D. For Portland cement-amended stuccoes, materials shall be prehydrated to reduce shrinkage. Lime and sand shall be thoroughly mixed, adding only enough water to produce a damp, workable mix that will retain its form when pressed into a ball. Stucco shall stand in this condition for 1 hour. Add Portland cement and remainder of water and mix to provide a workable consistency. Stucco should be easily thrown from trowel and adhere to the surface for easy spreading.

- E. Once final mixing water is added, do NOT over-mix (machine mix for 3-5 minutes).
- F. Portland cement and Portland cement-amended stucco should be used in 1 ½ to 2 hours.
Do not retemper or use partially hardened material.
- G. Wash all equipment promptly.

3.04 FINAL REPORT

The Contractor and Architect shall provide a final report of complete work including all approved submittals and photographs of the repaired areas taken before, during, and after the work.

END OF SECTION