

SECTION 04 01 20

**CLAY MASONRY RESTORATION AND CLEANING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes restoration and cleaning of brick as follows:
  - 1. Repairing clay masonry, including replacing damaged units.
  - 2. Re-Building clay masonry to re-establish integrity of wall
  - 3. Repointing mortar joints.
  - 4. Cleaning exposed clay masonry and surfaces.
  - 5. Mechanical anchorage and crack stitching.
- B. Related Sections include the following:
  - 1. Division 01 – Submittal Procedures
- C. Allowances: Base Bid includes clay masonry work based on the scope of work indicated in the contract documents.
  - 1. Provide unit prices for additions or deletions from the project. Unit prices shall be established for the following
    - a. masonry removal & rebuilding
    - b. masonry rake & repointing
    - c. masonry pinning and crack stitching
    - d. caulking.
  - 2. Unit prices apply to additions or deletions to Work as authorized by Change Orders.

1.03 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- B. Samples: Provide samples as follows;
  - 1. For each type of mortar proposed for pointing and repair and re-building, provide a sample mortar strip 6 inches long by 12 inch wide, set in aluminum or plastic channels.
  - 2. Each type of masonry repair anchor.

- C. Qualifications Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Cleaning Program: Describe cleaning process in detail, including materials, methods and equipment to be used and protection of surrounding materials on buildings and project site, and control of runoff during operations.
  - 1. If materials and methods other than those indicated are proposed for cleaning work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this project.
- E. LEED Documentation: Refer to paragraph 1.09 of this section and Division 1

#### 1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- B. Masonry Restoration Company Qualifications: Company shall have been performing work of a similar nature to the proposed project for a minimum of 5 years.
- C. Chemical Manufacturer Qualifications: A company regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project site inspection and assistance at no additional cost.
- D. Mockups: Prepare field samples for restoration methods and cleaning procedures to demonstrate aesthetic effects and qualities of materials and execution. Use materials and methods proposed for completed Work and prepare samples under same weather conditions to be expected during remainder of Work.
  - 1. Locate mockups on the building where directed by Architect/Owner.
  - 2. Masonry Repair: Prepare sample panels of size indicated for each type of masonry material indicated to be patched, rebuilt, or replaced. Erect sample panels into an existing wall, unless otherwise indicated, to demonstrate the quality of materials and workmanship.
  - 3. Cleaning: Prepare sample approximately 25 sq. ft. in area for each type of clay masonry and surface condition. Test cleaners and methods on samples of adjacent materials for possible adverse reactions, unless cleaners and methods are known to have a deleterious effect. Allow a waiting period of not less than 7 days after completion of sample cleaning to permit a study of sample panels for negative reactions.
  - 4. Repointing: Prepare 2 separate sample areas approximately 36 inches high by 72 inches wide for each type of repointing required; 1 for demonstrating methods and quality of workmanship expected in removing mortar from joints and the other for demonstrating quality of materials and workmanship expected in pointing mortar joints.
  - 5. Notify Architect/Owner 7 days in advance of the dates and times when samples will be prepared.
  - 6. Obtain Architect/Owner's approval of mockups before starting the remainder of clay masonry restoration and cleaning.
  - 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

- E. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 01 and this spec.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons. Palletize and store salvaged brick on site until ready to use.
- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location Do not use cementitious materials that have become damp.
- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store lime putty covered with water in sealed containers
- F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

#### 1.07 PROJECT CONDITIONS

- A. Repoint mortar joints and repair masonry only when air temperature is between and 40 and 90 deg F (4 and 32 deg C) and is predicted to remain so for at least 7 days after completion of work.
- B. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing:
  - 1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
  - 2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 7 days after repair and pointing.
- C. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 90 deg F (32 deg C) and above.
- D. Patch masonry only when air and surface temperatures are between and 55 and 100 deg F (13 and 38 deg C) and are predicted to remain above 55 deg F (13 deg C) for at least 7 days after completion of work. On days when air temperature is predicted to go above 90 degF (32 deg C), schedule patching work to coincide with time that surface being patched will be in shade or during cooler morning hours.
- E. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least 7 days after completion of cleaning.

#### 1.08 SEQUENCING AND SCHEDULING

- A. Order replacement materials at earliest possible date, to avoid delaying completion of the Work.

- B. Perform masonry restoration work in the following sequence:
  - 1. Repair existing masonry, including replacing existing masonry with new masonry materials.
  - 2. Rake out existing mortar from joints indicated to be repointed.
  - 3. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
  - 4. Point existing mortar joints of masonry indicated to be restored.
  - 5. Clean masonry surfaces.
- C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to match existing color and texture. Patch holes in mortar joints to comply existing color and texture.

#### 1.09 LEED Requirements

- A. Local/Regional Materials: Masonry and mortar supplier shall be located within 500 miles of the project location. In addition, all ingredients within the mortar mix shall be extracted, harvested or recovered within 500 miles of the project location. Submit documentation of manufacturing locations and origins of materials.
- B. Low emitting adhesives and sealants: Provide water-based, biodegradable form coating with maximum VOC content of 55 grams/liter. Provide cut sheet and/or material safety data sheet for form coating with VOC levels highlighted.
- C. Waste Management:
  - 1. Before work commences, designate locations or uses for excess mortar.
  - 2. Designate a location for cleaning out mixers.
  - 3. Collect waste and place in designated area for recycling.

## PART 2 -PRODUCTS

### 2.01 MASONRY MATERIALS

- A. Salvaged Face Brick and Accessories: Provide face brick to the greatest extent possible using salvaged bricks from the same job site. Bricks shall be clean and free of mortar/paint and other foreign material. If salvaged bricks are not available in sufficient quantity or quality, provide new face brick and accessories.
  - 1. Source salvaged bricks from demolition areas or other new exterior wall openings.
- B. New Face Brick and Accessories: Provide new face brick and accessories, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.
  - 1. Provide units with colors, size and shape, surface texture, and physical properties to match existing and meet owner's approval.
  - 2. Provide specially molded shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
  - 3. Provide specially ground units, shaped to match patterns, for arches and where indicated.
- C. Building Brick: Provide building bricks complying with ASTM C 62, of same vertical dimension as face brick, for masonry work concealed from view.

1. Grade SW, MW, or NW for concealed backup.

## 2.02 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Factory-Prepared Lime Putty: Screened, fully-slaked lime putty, prepared from pulverized lime complying with ASTM C 5.
- D. Mortar Sand: ASTM C 144, unless otherwise indicated.
  1. For pointing mortar, provide sand with rounded edges.
  2. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands, if necessary, to achieve suitable match.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars. Use as required to match existing mortar color.
- F. Water: Potable

## 2.03 CLEANING MATERIALS

- A. Water for Cleaning: Potable.
- B. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.
- C. Nonacidic Gel Cleaner: Manufacturer's standard nonacidic gel containing detergents and chelating agents and specifically formulated for cleaning masonry surfaces. Cleaner shall have a pH between 6 and 9 and shall not be considered a hazardous waste according to 40 CFR 261.
- D. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.
- E. Alkaline Prewash Cleaner: Manufacturer's standard alkaline cleaner for prewash applications used only where followed by an acidic cleaner of type indicated for afterwash.
- F. Products: Subject to compliance with requirements, provide one of the following:
  1. Restoration Cleaning:
    - a. Restoration Cleaner; ProSoCo, Inc.
    - b. Diedrich 101; Diedrich Chemicals, Inc.
    - c. 801 Heavy Duty Masonry Cleaner; ABR Products, Inc.
  2. Nonacidic Liquid Cleaner:
    - a. Bio-Cleanse; Dominion Restoration, Inc.
  3. Alkaline Prewash Cleaner:
    - a. Sure Klean 766 Prewash; ProSoCo, Inc.

## 2.04 MISCELLANEOUS MATERIALS

- A. Masonry Veneer Anchors, Triangular, Non-Adjustable Type: Anchors designed for masonry veneer attachment consisting of a 3/16-inch - diameter, hot-dipped galvanized triangular tie factory assembled to 12 gage, hot-dipped galvanized anchor with 5/16" hole for fastener.
- B. Masonry Repair Anchors, Spiral Type: Type 304 stainless-steel spiral rods designed to anchor to backing and veneer. Anchors are flexible in plane of veneer but rigid perpendicular to it.
  - 1. Provide driven in anchors designed to be installed in drilled holes and relying on screw effect rather than adhesive to secure them to backup and veneer.
    - a. Helifix 8mm Stainless Steel Helibar™
    - b. Heckmann Building Products, Inc. #391 Remedial Tie
    - c. Hohmann & Barnard, Inc., Helix Spiro-Ties
- C. Concrete Masonry Units: ASTM C90, Type 1 Standard, F'm: 1500 psi in 28 Days.

## 2.05 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand 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.
  - 1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, workable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not re-temper or use partially hardened material.
- B. Do not use admixtures of any kind in mortar, unless otherwise indicated.
- C. Mortar Proportions: Mix mortar materials in the following proportions:
  - 1. Pointing Mortar for Brick: 1 part portland cement, 1 parts lime, and 6 parts sand (Type N).
  - 2. Rebuilding (Setting) Mortar: Same as pointing mortar.
- D. Colored Mortar: Produce mortar of color required by using selected ingredients. Do not adjust proportions without Architect's approval.
  - 1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.

## PART 3 -EXECUTION

### 3.01 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
  - 1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
- B. Prevent mortar from staining face of surrounding masonry and other surfaces.
  - 1. Cover sills, ledges, and projections to protect from mortar droppings.
  - 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
  - 3. Immediately remove mortar in contact with exposed masonry and other surfaces.

4. Clean mortar splatters from scaffolding at end of each day.
- C. Cleaning
1. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be injured by such contact.
  2. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces. Neutralize and collect alkaline wastes for disposal off Owner's property. (NOTE: Contractor may seek approval for environmentally friendly materials, through Utility, to allow for their runoff into the city storm sewer.)
  3. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
  4. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles that must remain in operation during course of masonry restoration work.

### 3.02 UNUSED ANCHOR REMOVAL

- A. Remove masonry anchors, brackets, wood nailers, embedded ferrous metals and other extraneous items no longer in use unless indicated to remain.
- 1 Remove items carefully to avoid spalling or cracking masonry.
  - 2 If item cannot be removed without damaging surrounding masonry, cut off item flush with surface and core drill surrounding masonry and item as close around item as practical. Core to a minimum depth of 2" below surface and a maximum depth of 4". Remove core and cut back item. Patch brick or replace brick as required.
  - 3 Patch holes where items were removed unless directed to remove and replace units.

### 3.03 BRICK REMOVAL AND REPLACEMENT

- A. Remove bricks that are damaged, heavily spalled, deteriorated, or as otherwise indicated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Notify Engineer of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition (Salvage) as many whole bricks as possible.
1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
  2. Store brick for reuse, as indicated.
  3. Deliver cleaned brick not required for reuse to Owner, unless otherwise directed.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use

a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

- G. In areas of rebuild, repoint back-up wythe, mortar collar joint, and fasten new wythe to sound back-up with veneers anchors spaced at 24" o.c. (max) horizontal and 16" o.c. (max) vertical.
- H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. (30 g/194 sq. cm per min.). Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.
  - 1. Tool exposed mortar joints to be concave.

### 3.04 CLEANING MASONRY, GENERAL

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.
- B. Use only those cleaning methods indicated for each masonry material and location.
  - 1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
  - 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
    - a. Equip units with pressure gages.
  - 3. For water spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
- C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including comers, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.
- D. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.
  - 1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
- E. Water Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (150 mm) from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.
- F. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

### 3.05 CLEANING BRICKWORK

- A. Detergent Cleaning:
  - 1. Wet masonry with cold water applied by low-pressure spray.
  - 2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that masonry surface remains wet.



3. Rinse with cold water applied by medium-pressure spray to remove detergent solution and soil.
4. Repeat procedure above where required to produce the cleaning effect established by mockup.

### 3.06 REPOINTING MASONRY

- A. Rake out and re-point mortar joints to the following extent:
  1. All joints in areas indicated.
  2. Joints where mortar is missing or where they contain holes.
  3. Cracked joints where cracks can be penetrated at least 1/4 inch (6 mm) by a knife blade 0.027 inch (0.7 mm) thick.
  4. Cracked joints where cracks are 1/8 inch (3 mm) or more in width and of any depth.
  5. Joints where they sound hollow when tapped by metal object.
  6. Joints where they are worn back 1/4 inch (6 mm) or more from surface.
  7. Joints where they are deteriorated to point that mortar can be easily removed by hand.
  8. Joints, other than those indicated as sealant-filled joints, where they have been filled with substances other than mortar.
- B. Do not rake out and repoint joints where not required
- C. Rake out joints as follows:
  1. Remove mortar from joints to depth not less than 1 inch or not less than that required to expose sound, unweathered mortar.
  2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
  3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect/Engineer.
    - a. Cut out mortar by hand with chisel and mallet. Power-operated grinders may be used with Engineer's approval based on demonstrated ability of operators to use tools without damaging masonry. In no case shall vertical joints be cut with power tools.
    - b. Cut out center of mortar bed joints using angle grinders with diamond- impregnated metal blades. Remove remaining mortar by hand with chisel and mallet.
- D. Notify Architect/Engineer of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Point joints as follows:
  1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen masonry-joint surfaces before pointing.
  2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch (9 mm) until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
  3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 1/4 inch (6 mm). Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks have worn or rounded edges,

slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar over edges onto exposed masonry surfaces or to featheredge mortar.

4. When mortar is thumbprint hard, tool joints to concave. Remove excess mortar from edge of joint by brushing.
- F. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.
1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
  2. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
- G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

### 3.07 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
1. Do not use metal scrapers or brushes.
  2. Do not use acidic or alkaline cleaners.
- B. Wash adjacent woodwork and other non-masonry surfaces. Use detergent and soft brushes or cloths.
- C. Clean masonry debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- D. Sweep and rake adjacent pavement and grounds to remove masonry debris. Where necessary, pressure wash surfaces to remove mortar, dust, dirt, and stains.

### 3.08 FIELD QUALITY CONTROL

- A. Owner's Project Representatives: Project representatives will be observing progress and quality of portion of the Work completed. Allow Project representatives use of scaffolding, as needed, to observe progress and quality of portion of the Work completed.
- B. Notify Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Project representatives have had reasonable opportunity to make observations of work areas at lift device or scaffold location.

END OF SECTION