

SECTION 04901 - CLAY MASONRY CLEANING AND RESTORATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Removing plant growth.
 - 2. Repairing clay masonry, including replacing damaged units.
 - 3. Reanchoring veneers.
 - 4. Cleaning exposed clay masonry surfaces.
 - 5. Repointing mortar joints.
- B. Related Sections include the following:
 - 1. Division 4 Sections
- C. Unit Prices: Clay masonry restoration and cleaning to be provided under unit prices are described in Division 1 Section "Unit Prices."

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi ; 4 to 6 gpm.
- B. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.
- C. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

1.4 SUBMITTALS

- A. Product Data: For each product indicated. Include recommendations for application and use. Include test reports and certifications substantiating that products comply with requirements.
- B. Samples for verification, before erecting the mockup, of the following:
 - 1. Each type of mortar for pointing and masonry rebuilding and repair in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.

2. Each type of repair anchor.
 3. Each type of chemical cleaner.
- C. Qualification 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. Restoration program for each phase of the restoration process, including protection of surrounding materials on the building and Project site during operations. Describe in detail the materials, methods, equipment, and sequence of operations to be used for each phase of the restoration work.
1. If alternative materials and methods to those indicated are proposed for any phase of restoration work, provide a written description, including evidence of successful use on other comparable projects, and a testing program to demonstrate their effectiveness for this Project.
- E. Cleaning program indicating cleaning process, including protection of surrounding materials on building and Project site, and control of runoff during operations. Describe in detail the materials, methods, and equipment to be used.
1. If materials and methods other than those indicated are proposed for cleaning work, provide a written description, including evidence of successful use on other comparable projects, and a testing program to demonstrate their effectiveness for this Project.

1.5 QUALITY ASSURANCE

- A. Restoration Specialist: Engage an experienced masonry restoration and cleaning firm that has completed work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
1. At Contractor's option, the work may be divided between 2 specialist firms: 1 for cleaning work and 1 for repair work.
 2. Field Supervision: Require restoration specialist firms to maintain an experienced full-time supervisor on the Project site during times that clay masonry restoration and cleaning are in progress.
- B. 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.
- C. 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.

2. Prepare the Following Mock-Ups: Pointing of Joints in Masonry: One panel including at least 6 linear feet of joint.
 3. 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.
 4. Cleaning: Prepare sample approximately 25 sq. ft. in area for each type of clay masonry and surface condition.
 - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions, unless cleaners and methods are known to have a deleterious effect.
 - b. 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.
 5. 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.
 6. Notify Architect 7 days in advance of the dates and times when samples will be prepared.
 7. Obtain Architect's approval of mockups before starting the remainder of clay masonry restoration and cleaning.
 8. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
- D. Preconstruction Testing: Owner will engage an independent testing agency to perform preconstruction testing. Submit samples of each proposed type of replacement brick for testing.
- E. Preconstruction Testing: Engage an independent testing agency experienced in performing the type of tests indicated and approved by Architect to perform preconstruction tests.
1. Preconstruction Brick Tests: Test brick according to sampling and testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).
 - a. Test each proposed type of replacement brick.
 - b. Test each type of existing brick indicated for replacement. Carefully remove existing bricks from locations designated by Architect.
- F. Source of Materials: Obtain materials for masonry restoration from a single source for each type of material required (face brick, cement, sand, etc.) to ensure a match of quality, color, pattern, and texture.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Carefully pack, handle, and ship masonry units and accessories strapped together in suitable packs or pallets or in heavy-duty cartons.
- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with type and name of products and manufacturers.
- C. Store cementitious materials off the ground, under cover, and in a dry location.
- D. Store aggregates, covered and in a dry location, where grading and other required characteristics can be maintained and contamination avoided.
- E. Comply with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.7 PROJECT CONDITIONS

- A. Do not repoint mortar joints or repair masonry unless air temperature is between and 40 and 80 deg F and will remain so for at least 48 hours 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, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
 - 2. When mean daily air temperature is between 25 and 40 deg F, cover completed Work with weather-resistant, insulating blankets for 48 hours after repair and pointing.
 - 3. When mean daily air temperature is below 25 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after repair and pointing.
- C. Hot-Weather Requirements: Protect restoration work when temperature and humidity conditions produce excessive evaporation of water from mortar and patching 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 and above.
- D. Clean masonry surfaces only when air temperature is 40 deg F and above and will remain so for at least 7 days after completion of cleaning.
- E. Prevent grout or mortar used in repointing and repair work from staining face of surrounding masonry and other surfaces. Immediately remove grout and mortar in contact with exposed masonry and other surfaces.
- F. Protect sills, ledges, and projections from mortar droppings.

1.8 SEQUENCING AND SCHEDULING

- A. Order replacement materials at the earliest possible date, to avoid delaying completion of the Work.
- B. Perform masonry restoration work in the following sequence:
 1. Remove plant growth.
 2. Repair existing masonry, including replacing existing masonry with new masonry materials.
 3. Rake out existing mortar from joints indicated to be repointed.
 4. Point existing mortar joints of masonry indicated to be restored.
 5. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 6. Clean masonry surfaces. Remove paint before general cleaning.
 7. Rake out existing mortar from joints indicated to be repointed.
 8. Point existing mortar joints of masonry indicated to be restored.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 1. Diedrich Chemicals Restoration Technologies, Inc.
300A East Oak Street
Oak Creek, WI 53154
414/764-0058 or 800/323-3565
 2. ProSoCo, Inc.
755 Minnesota Avenue
P.O. Box 1578
Kansas City, KS 66117
800/255-4255 or 913/281-2700
 3. Union Carbide Corporation
Old Ridgebury Road
Danbury, CT 06817
203/794-2000
 4. Rohm & Haas
Independence Mall West
Philadelphia, PA 19105
215/592-3000
 5. GAF Corporation
1361 Alps Road
Wayne, NJ 07470
201/628-4127

6. Ashland Chemical
4550 N. East Expressway
Doraville, GA 30340
404/448-7010

B. Products: Subject to compliance with requirements, provide one of the following:

1. Nonacidic Gel Cleaner:
 - a. Sure Klean 942 Masonry Cleaner; ProSoCo, Inc.
2. Nonacidic Liquid Cleaner:
 - a. Bio-Cleanse; Dominion Restoration, Inc.
3. Alkaline Prewash Cleaner:
 - a. Sure Klean 766 Prewash; ProSoCo, Inc.
4. Mild Acidic Cleaner:
 - a. DR-60 Stone and Masonry Cleaner; Dominion Restoration, Inc.
 - b. Sure Klean Light-Duty Restoration Cleaner; ProSoCo, Inc.
5. Acidic Cleaner:
 - a. Diedrich 101G Granite, Terra Cotta, and Brick Cleaner; Diedrich Technologies, Inc.
 - b. Hydroclean Brick, Granite, Sandstone and Terra Cotta Cleaner (HT-626); Hydrochemical Techniques, Inc.
 - c. Sure Klean Heavy-Duty Restoration Cleaner; ProSoCo, Inc.
 - d. Sure Klean 1028 Restoration Cleaner; ProSoCo, Inc.
 - e. Sure Klean Restoration Cleaner; ProSoCo, Inc.
6. Alkaline Paint Remover:
 - a. Diedrich 404/606/606X Paint Remover; Diedrich Technologies, Inc.
 - b. Hydroclean Heavy Duty Paint Remover (HT-716); Hydrochemical Techniques, Inc.
 - c. Enviro Strip #1; ProSoCo, Inc.
 - d. Enviro Strip #2; ProSoCo, Inc.
 - e. 1217 Poultice/Paint Stripper; ProSoCo, Inc.
 - f. Sure Klean Heavy-Duty Paint Stripper; ProSoCo, Inc.
7. Adhesive Residue Remover:
 - a. Commercially available emulsified, non-corrosive, non-caustic liquid solvent cleaner specifically formulated for removal of asphalt, grease, oil and similar stains from brick, stone and other masonry surfaces, such as "Sure Klean Asphalt and Tar Remover" (ProSoCo, Inc.), or approved equal.

9. Ferrous-Based Stain Remover:
 - a. Commercially available liquid stain removing compound made up of blended organic acids in combination with special chelating and wetting agents specifically formulated for treatment and removal of metallic oxides from masonry, such as "Sure Klean Ferrous Stain Remover" (ProSoCo, Inc.), or approved equal.
10. Non-ionic detergent:
 - a. "Zyfo" or "Tergitol" (Union Carbide, or Ashland Chemical)
 - b. "Triton" (Rohm & Haas)
 - c. "Igepal" (GAF Corporation), or approved equal.
11. Trisodium Phosphate:
 - a. Strong base-type powdered cleaning material sold under brand names.
 - b. Other chemical or common names include Sodium Orthophosphate; Tri-basic sodium phosphate; Trisodium orthophosphate; TSP*; Phosphate of soda.
12. Solvent-Type Paint Remover:
 - a. Diedrich 505 Special Coatings Stripper; Diedrich Technologies, Inc.
 - b. Diedrich 505X Dry Strip; Diedrich Technologies, Inc.
 - c. Dominion Multi-Layer Paint & Graffiti Remover; Dominion Restoration, Inc.
 - d. Hydroclean Solvent Paint Remover (HT-300); Hydrochemical Techniques, Inc.
 - e. Non-Methylene Chloride Paint Stripper; ProSoCo, Inc.
 - f. Sure Klean 509 Paint Stripper; ProSoCo, Inc.
 - g. Sure Klean 859 Paint Stripper; ProSoCo, Inc.
 - h. Sure Klean 940 Paint Stripper; ProSoCo, Inc.
13. Solvents such as acetone, lacquer thinner, N-methy-2-pyrrolidone Acetone (C₃H₆O):
 - a. A volatile fragrant flammable liquid ketone used chiefly as a solvent and in organic synthesis.
 - b. Other chemical or common names include Dimethyl ketone; Propanone
14. Low-Odor, Solvent-Type Paint Remover:
 - a. Enviro Strip #3; ProSoCo, Inc.
 - b. Enviro Strip #4; ProSoCo, Inc.
15. Liquid Strippable Masking Agent:
 - a. Diedrich Acid Guard; Diedrich Technologies, Inc.
 - b. Sure Klean Acid Stop; ProSoCo, Inc.
16. Filler material such as attapulgite clay, kaolin, fuller's earth, talc, chalk, cotton pads, acid-free paper. (Do not use chalk or iron-containing clay with an acid solvent as their chemical reaction will cancel the effectiveness of the acid).

17. Masonry Repair Anchors, Expansion Type:
 - a. Mechanical Repair Anchors; Dur-O-Wal, Inc.
 - b. #521RA Repair/Restoration Anchor; Hohmann & Barnard, Inc.
18. Masonry Repair Anchors, Spiral Type:
 - a. Dur-O-Flex; Dur-O-Wal, Inc.
 - b. #391 Spiro Remedial Tie; Heckman Building Products, Inc.
 - c. Helifix HRT60; Helifix Ltd.
 - d. Helifix HRT80; Helifix Ltd.

2.2 MASONRY MATERIALS

- A. Face Brick and Accessories: Provide face brick and accessories, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.
 1. Provide units with color, surface texture, size, and shape to match existing brick work and with physical properties not less than those determined from preconstruction testing of selected existing units.
 2. Provide units with color, surface texture, and physical properties to match Architect's sample. Match existing units in size and shape.
- B. Building Brick: Provide building brick complying with ASTM C 62, of same vertical dimension as face brick, for masonry work concealed from view.
 1. Grade SW where in contact with earth.
 2. Grade SW, MW, or NW for concealed backup.

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II.
 1. Provide white cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Quicklime: ASTM C 5, pulverized lime.
- D. Aggregate for Mortar: ASTM C 144, unless otherwise indicated.
 1. Colored-Mortar Aggregate: Natural or manufactured sand selected to produce mortar color indicated.
 2. For pointing mortar, provide sand with rounded edges.
 3. Match size, texture, and gradation of existing mortar as closely as possible.

- 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.
- F. Water: Potable.

2.4 CLEANING MATERIALS

- A. Water for Cleaning: Potable.
- B. Warm Water: Heat water to a temperature of 140 to 160 deg F.
- C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium polyphosphate (TSPP), 1/2 cup of laundry detergent (Tide, All, etc.), 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of warm water for each 5 gal. of solution required.
- D. 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.
- E. Non-acidic 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.
- F. Alkaline Prewash Cleaner: Manufacturer's standard alkaline cleaner for prewash applications used only where followed by an acidic cleaner of type indicated for afterwash.
- G. Mild Acidic Cleaner: Manufacturer's standard mildly acidic cleaner containing no hydrochloric, hydrofluoric, or sulfuric acid; chlorine bleaches; or caustic soda.
- H. Acidic Cleaner: Manufacturer's standard-strength acidic masonry restoration cleaner composed of hydrofluoric acid blended with other acids, including a trace of phosphoric acid, and combined with special wetting systems and inhibitors.
- I. Alkaline Paint Remover: Manufacturer's standard alkaline paste formulation for removing paint coatings from masonry.
- J. Solvent-Type Paint Remover: Manufacturer's standard thixotropic, water-rinsable solvent formulation for removing paint coatings from masonry.
- K. Low-Odor, Solvent-Type Paint Remover: Manufacturer's standard low-odor, thixotropic, water-rinsable solvent formulation, containing no methanol or methylene chloride, for removing paint coatings from masonry.
- L. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from the damaging effects of acidic and alkaline masonry cleaners.

2.5 MISCELLANEOUS MATERIALS

- A. Masonry Repair Anchors, Expansion Type: Mechanical fasteners designed for masonry veneer stabilization consisting of a 1/4-inch diameter, Type 304 stainless-steel rod with brass expanding shells at each end and a water-shedding washer in the middle. Expanding shells shall be designed to provide positive mechanical anchorage to veneer on one end and backup masonry on other end.
- 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 adhesive installed anchors complete with manufacturer's standard epoxy adhesive and injection tubes, screens, sleeves, or other devices required for installation.
 - 2. 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.
- C. Brushes: Natural fiber bristle only. The use of wire brushes or steel wool is not permitted.
- D. Wood spatula

2.6 MORTAR MIXES

- A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.
- B. 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.
 - 1. Mixing Pointing 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 1 to 2 hours. Add remaining water in small portions until reaching mortar of the desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- C. 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.
- D. Do not use admixtures of any kind in mortar, unless otherwise indicated.
- E. Mortar Proportions: Mix mortar materials in the following proportions:

1. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts colored- or natural-mortar aggregate.
2. Rebuilding Mortar: Same as pointing mortar.
3. Rebuilding Mortar: Comply with ASTM C 270, Proportion Specification, Type N, unless otherwise indicated; with cementitious material content limited to portland cement and lime.

2.7 CHEMICAL CLEANING SOLUTIONS

- A. Dilute chemical cleaners with water to produce solutions of concentration recommended by chemical cleaner manufacturer, unless otherwise indicated.
- B. Acidic Cleaner Solution for Brick: Unless otherwise indicated, dilute with water to produce a hydrofluoric acid content of 3 percent or less, but not greater than that recommended by chemical cleaner manufacturer.
- C. Acidic Cleaner Solution for Terra Cotta: Dilute with water to a concentration demonstrated by testing that does not etch or otherwise damage terra cotta surface, but not greater than that recommended by chemical cleaner manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Comply with chemical cleaner manufacturer's written instructions for protecting building surfaces against damage from exposure to their products.
- B. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from injury resulting from masonry restoration work.
 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.
 3. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
 4. 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.
 5. 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.
- C. Protect adjacent surfaces from contact with chemical cleaners by covering them with a liquid strippable masking agent or polyethylene film and waterproof masking

tape. Apply masking agent to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces.

3.2 BRICK REMOVAL AND REPLACEMENT

- A. Carefully remove by hand, at locations indicated, bricks that are damaged, spalled, or deteriorated. Cut out full units from joint to joint and in a manner to permit replacement with full-size units without damaging surrounding masonry.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Salvage as many whole, undamaged bricks as possible.
- D. Remove mortar, loose particles, and soil from salvaged brick by cleaning with brushes and water. Store brick for reuse.
- E. Clean remaining brick at edges of removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Install new or salvaged brick to replace removed brick. Fit replacement units 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. 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 clay bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g per 30 sq. in. per min. Use wetting methods that ensure units are nearly saturated but surface dry when laid. Maintain joint width for replacement units to match existing units.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
 - 2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry.

3.3 REANCHORING VENEERS

- A. Install masonry repair anchors in horizontal mortar joints and according to manufacturer's written instructions. Install at not more than 16 inches o.c. vertically and 32 inches o.c. horizontally, unless otherwise indicated. Install at locations to avoid penetrating flashing.
- B. Recess anchors at least 5/8 inch from surface of mortar joint and fill recess with pointing mortar.

3.4 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. Work from bottom to top of the building for each scaffold drop.
- B. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Use natural-fiber brushes only.
 - 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 gauges.
 - 3. For chemical cleaner spray application, use a low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with a cone-shaped spray tip.
 - 4. For water spray application, use a fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
 - 5. For high-pressure water spray application, use a fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
 - 6. For heated water spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
 - 7. For steam application, use a steam generator capable of delivering live steam at nozzle.
- C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.
- D. Removing Plant Growth: Completely remove plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.
 - 1. Apply ammonium sulfamate or another acceptable root-killing material to plant roots according to manufacturer's written instructions. Do not apply materials to plants that are to remain.
- E. Water Application Methods: Where water application methods are indicated, comply with the following:
 - 1. Spray Applications: Spray apply water to masonry surfaces to comply with requirements indicated for location, purpose, water temperature, pressure, volume, and equipment. Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water from side to side in overlapping bands to produce uniform coverage and an even effect.
 - 2. Steam Wash: Apply steam to masonry surfaces at pressures not exceeding 80 psi. Hold nozzle at least 6 inches from surface of masonry and apply

steam from side to side or in direction of tooling in overlapping bands to produce uniform coverage and an even effect.

- F. Chemical Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical cleaner manufacturer's written instructions; use brush or spray application methods, at Contractor's option, unless otherwise indicated. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
 - 1. Spray Application: Apply chemical cleaners at pressures not exceeding 50 psi, unless otherwise indicated.
 - 2. Reapplying Chemical Cleaners: Do not apply chemical cleaners to same masonry surfaces more than twice. If additional cleaning is required, use a steam wash.
- G. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting.

3.5 CLEANING BRICKWORK

- A. Cold-Water Wash: Clean brick masonry with cold water applied as follows:
 - 1. Low-pressure spray.
- B. Warm-Water Wash: Clean brick masonry with warm water applied as follows:
 - 1. Low-pressure spray.
- C. Detergent Cleaning: Clean brick masonry with a detergent solution applied as follows:
 - 1. Wet masonry with cold water applied by low-pressure spray.
 - 2. Wet masonry with warm water applied by low-pressure spray.
 - 3. 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.
 - 4. Rinse with cold water to remove detergent solution and soil.
 - 5. Rinse with warm water to remove detergent solution and soil.
 - a. Apply rinse by low-pressure spray.
 - 6. Repeat cleaning procedure above where required to produce the cleaning effect established by mockup.
- D. Non-acidic Liquid Chemical Cleaning: Clean brick masonry with a non-acidic liquid cleaner applied as follows:
 - 1. Wet masonry with water of a temperature recommended by the manufacturer applied by low-pressure spray.

2. Apply cleaner to masonry. Let cleaner remain on surface for period indicated below:
 - a. As determined by testing during the mockup.
 3. Rinse with cold water to remove chemicals and soil.
 - a. Apply rinse by low-pressure spray.
 4. Repeat cleaning procedure above where required to produce the cleaning effect established by mockup. Do not apply more than twice.
- E. Mild Acidic Chemical Cleaning: Clean brick masonry with a mild acidic cleaner applied as follows:
1. Wet masonry with water of a temperature recommended by the manufacturer applied by low-pressure spray.
 2. Apply cleaner to masonry. Let cleaner remain on surface for period indicated below:
 - a. As determined by testing during the mockup.
 3. Rinse with cold water to remove chemicals and soil.
 - a. Apply rinse by low-pressure spray.
 4. Repeat cleaning procedure above where required to produce the cleaning effect established by mockup. Do not apply more than twice.
- F. Acidic Chemical Cleaning: Clean brick masonry with an acidic cleaner applied as follows:
1. Wet masonry with water of a temperature recommended by the manufacturer applied by low-pressure spray.
 2. Apply cleaner to masonry. Let cleaner remain on surface for period indicated below:
 - a. As determined by testing during the mockup.
 3. Rinse with cold water to remove chemicals and soil.
 - a. Apply rinse by low-pressure spray.
 4. Repeat cleaning procedure above where required to produce the cleaning effect established by mockup. Do not apply more than twice.
- G. Non-acidic Gel Chemical Cleaning: Clean brick masonry with a non-acidic gel cleaner applied as follows:
1. Wet masonry with water of a temperature recommended by manufacturer applied by low-pressure spray.

2. Apply non-acidic gel cleaner in a 1/8-inch thickness by brush, working into joints and crevices. Apply quickly and do not brush out excessively so area will be uniformly covered with fresh cleaner and dwell time will be uniform throughout area being cleaned.
 3. Let cleaner remain on surface for period indicated below:
 - a. As determined by testing during the mockup.
 4. Remove bulk of non-acidic gel cleaner by squeegeeing into containers for disposal.
 5. Rinse with warm water to remove chemicals and soil.
 - a. Apply rinse by low-pressure spray.
 6. Repeat cleaning procedure above where required to produce the cleaning effect established by mockup. Do not apply more than twice.
- H. Paint Removal with Alkaline Paint Remover: Remove paint from masonry surfaces as follows:
1. Apply paint remover to dry, painted masonry with brushes.
 2. Allow paint remover to remain on surface for period recommended by manufacturer.
 3. Rinse with cold water to remove chemicals and paint residue.
 4. Rinse with warm water to remove chemicals and paint residue.
 - a. Apply rinse by low-pressure spray.
 5. Apply an acidic cleaner to masonry, while surface is still wet, using low-pressure spray equipment or a soft-fiber brush. Let cleaner remain on surface for period recommended by chemical cleaner manufacturer, unless otherwise indicated.
 6. Rinse with cold water to remove chemicals and soil.
 - a. Apply rinse by low-pressure spray.
- I. Adhesive Removal:
1. Remove large accumulations by mechanical scraping with a wood spatula taking care to avoid damage to masonry.
 2. Brush apply solvent-based water rinse-able cleaner with a fine bristle brush to area damaged by tape residue.
 3. Allow to dwell for three to five minutes. Agitate with a stiff fiber bristle brush as necessary.
 4. Thoroughly rinse with low pressure water (400 psi).
 5. Repeat application to remove persistent stains and deeply embedded residues.
- J. Paint Removal with Solvent-Type Paint Remover: Remove paint from masonry surfaces as follows:

1. Apply thick coating of paint remover to painted masonry with natural-fiber cleaning brush, deep-nap roller, or large paint brush.
2. Allow paint remover to remain on surface for period recommended by manufacturer. Agitate periodically with a stiff-fiber brush.
3. Rinse with cold water to remove chemicals and paint residue.
 - a. Apply rinse by low-pressure spray.

3.7 GRAFFITTI REMOVAL

- A. Identify the substance used to create the graffiti.
- B. Examine the surrounding area for signs of what may have been used to create the graffiti (i.e. spray cans or other debris).
- C. Begin with the least harsh method of removing paint.
 1. Wash the area with a solution of trisodium phosphate (TSP) and water. Apply with a non-metallic brush.
 2. When the paint has softened, scrape off as much as possible with a wooden scraper.
 3. Wash the area again using a non-ionic detergent and water.
 4. Thoroughly rinse the surface with clean, clear water.
- D. If a stronger method is necessary:
 1. Brush on a commercial paint remover (either a solvent such as lacquer thinner or acetone, or a methylene chloride-based remover may be used) with a non-metallic brush. Follow manufacturers instructions for application and dwell time.
 2. When the paint has softened, scrape off as much as possible with a wooden scraper.
 3. Wash the area again using a detergent and soapy water and rinse thoroughly with clean water.
- E. For felt tip marks, use a poultice:
 1. Pre-wet surface using denatured alcohol. Saturate a soft cloth with a mixture of acetone, lacquer thinner and N-methy-2-pyrrolidone. Test proportions to find the most effective mixture.
 2. Gently rub the stain with the saturated cloth.
 3. To remove remaining stain, prepare a poultice using the same solvent mixture as used in C.2. above mixed with a filler material such as attapulgite clay, kalin or fuller's earth (all clays), talc, chalk or whiting, shredded acid-free paper, or cotton pads. Mix to form a thick paste.
 4. Thoroughly wet the masonry surface to be treated with clean, clear water.
 5. Apply the mixture to the stained area in a 1/4" to 3/4 " thick layer using a wood or plastic spatula and allow to dry. Be sure to spread the poultice well beyond the stained area. The liquid portion of the paste will migrate into the concrete where it will dissolve some of the staining material. Then the liquid

- will gradually move back beyond the concrete surface and into the poultice, where it will evaporate, leaving the dissolved staining material in the poultice.
6. Keep poultice moist until stain has lifted. Exact length of time will vary and will require periodic inspection of the substrate.
 7. Once it appears that the stain has lifted, allow the poultice to dry out. As the poultice dries, the solvent is re-absorbed by the poultice material bringing with it the stain.
 8. When the poultice has dried, brush or scrape it off with a wooden scraper.
 9. Using a stiff bristle brush, scrub the surface with scouring powder and clean water to remove any residual staining.
 10. Wash all residue using a non-ionic detergent.
 11. Thoroughly rinse the area with clean, clear water and allow to dry.
 12. Repeat the process as necessary to sufficiently remove the stain.

3.8 FERROUS STAIN REMOVAL

A. Surface Preparation:

1. Commence ferrous stain removal immediately after general cleaning of masonry.
2. Proceed from the top of the wall downward. Work shall not be considered complete until the Contracting Officer's representative has so notified the Contractor in writing.
3. Filter the water with a 5 micron particulate filter placed in line with the water supply. Replace the filter as needed during the work.

B. Application:

1. Prewet wall with clean, clear water immediately before applying ferrous-based stain remover.
2. Apply ferrous-based stain remover with natural fiber bristle brush. Allow to dwell on the surface for three to five minutes.
3. Rinse all traces of chemical and residue with pressurized cold water. Repeat procedure if necessary. Rinse water pressure shall not exceed 300 psi, and shall be sprayed through nozzles fitted with 15 to 20 wide nozzle tips. Nozzles shall be held perpendicular to the surface at a working distance of 1.5 to 2.5 feet. All pressure pumps shall be equipped with working pressure gauges.
4. Repeat procedure if necessary to remove all traces of ferrous stain.

3.6 REPOINTING MASONRY

A. Rake out joints as follows:

1. Rake out mortar from joints to depths equal to 2-1/2 times their widths, but not less than 1/2 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 damaged masonry units.
 - a. Cut out old mortar by hand with a chisel and mallet, unless otherwise indicated.
 - b. Do not use power-operated grinders without Architect's written approval based on submission by Contractor of a satisfactory quality-control program and demonstrated ability of operators to use tools without damaging masonry. Quality-control program shall include provisions for supervising performance and preventing damage due to worker fatigue.
- B. Point joints as follows:
1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at the time of pointing, excess water has evaporated or run off and joint surfaces are damp but free of standing water.
 2. Apply the first layer of pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Compact each layer thoroughly and allow it to become thumbprint hard before applying the next layer.
 3. After joints have been filled to a uniform depth, place remaining pointing mortar in 3 layers with first and second layers each filling about two-fifths of joint depth; third layer, the remaining one-fifth. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks have rounded edges, slightly recess final layer from face. 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 match original appearance of joints, unless otherwise indicated. Remove excess mortar from edge of joint by brushing.
 5. Cure mortar by maintaining in a damp condition for at least 72 hours.
 6. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.7 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use stiff-nylon or -fiber brushes and clean water, spray applied at a low pressure.
- B. Do not use metal scrapers or brushes.
- C. Do not use acidic or alkaline cleaners.

END OF SECTION 04901