

SECTION 04 01 20 – MASONRY RESTORATION AND CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Repairing masonry, including replacing damaged units.
 - 2. Cleaning exposed masonry surfaces.
 - 3. Repointing mortar joints.
- B. Related Sections include the following:
 - 1. Division 04 Section "Unit Masonry" for new brick and masonry units.
 - 2. Division 07 Section "Water Repellents" for water repellents applied to masonry.
 - 3. Division 07 Section "Joint Sealants" for sealing joints in restored masonry.

1.3 DEFINITIONS

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

1.4 UNIT PRICES

- A. Specific work of this section is itemized as Unit Prices on the Bid Form to add or deduct specific units of work to the project. Unit Price descriptions, requirements and units of work are enumerated in Division 01 Section "Unit Prices." Unit Prices are inclusive of all labor, materials, overhead and profit per unit of work indicated.

1.5 ACTION 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.

1.6 INFORMATIONAL SUBMITTALS

- A. 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.
- B. Cleaning Program: Indicate 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.

1.7 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review specification requirements.
 - 2. Review installation procedures.
 - 3. Inspect project conditions.

1.8 QUALITY ASSURANCE

- A. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 50 feet away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.
- B. 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 two specialist firms: one for cleaning work and one for repair work.
 - 2. Field Supervision: Require restoration specialist firms to maintain an experienced full-time supervisor on the Project site during times that masonry restoration and cleaning are in progress.
 - 3. Restoration Work Qualifications: Persons who are experienced in restoration work of types they will be performing.
- C. Chemical-Cleaner Manufacturer Qualifications: A firm 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. 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.
- E. 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.

MASONRY RESTORATION AND CLEANING

1. Locate mockups on the building where directed by Architect.
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 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.
4. Repointing: Prepare 2 separate sample areas approximately 36 inches high by 36 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 Owner 7 days in advance of the dates and times when samples will be prepared.
6. Obtain approval of mockups before starting the remainder of masonry restoration and cleaning.
7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.9 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.

1.10 PROJECT CONDITIONS

- A. Do not repoint mortar joints or repair masonry unless air temperature is between 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.

MASONRY RESTORATION AND CLEANING

- 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.

PART 2 - PRODUCTS

2.1 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
- B. Basis of Design: Subject to compliance with requirements, Masonry Cleaners incorporated into the project shall be based on products as follows:
 - 1. Alkaline Prewash Cleaner: ProSoCo, Inc.; "Sure Klean 766 Prewash."
 - 2. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining: ProSoCo, Inc.; "Sure Klean No. 101 Lime Solvent."
 - 3. Cleaners for Brick Subject to Metallic Staining: ProSoCo, Inc.; "Sure Klean Vana Trol."
 - 4. Cleaners for Exterior Decorative Masonry Units: ProSoCo, Inc.; "Burnished Custom Masonry Cleaner."
 - 5. Stain Treatment for Limestone: ProSoCo, Inc.; "Sure Klean Limestone Restorer."
 - 6. Liquid Strippable Masking Agent: ProSoCo, Inc.; "Sure Klean Acid Stop."
- C. Acceptable Manufacturers: Subject to compliance with requirements, in lieu of the Basis of Design manufacturer, Contractor may provide products from the following manufacturers that meet or exceed the published data of the specified Basis of Design product:
 - 1. Diedrich Technologies, Inc.
 - 2. EaCo Chem, Inc.

2.2 MASONRY REPAIR ANCHORS

- A. Products: Subject to compliance with requirements, provide masonry repair anchors as follows:
 - 1. Expansion Type: Mechanical fasteners designed for masonry veneer stabilization consisting of a ¼-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.
 - a. Dur-O-Wal, Inc.; "Mechanical Repair Anchors."

- b. Hohmann & Barnard, Inc.; "#521 RA-B Repair/Restoration Anchor."
- 2. Spiral Type: Spiral anchors flexible in plane of veneer but rigid perpendicular to plane of veneer. Type 304 stainless steel spiral rods designed to anchor to backing and veneer.
 - a. Dur-O-Wal, Inc.; "Dur-O-Flex."
 - b. Heckman Building Products, Inc.; "#391 Spiro Remedial Tie."

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. 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.
- D. Water: Clean and potable.

2.4 MORTAR MIXES

- A. 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.
- B. Colored Mortar: Produce mortar of color required by using selected ingredients. Do not adjust proportions without approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.
- C. Do not use admixtures of any kind in mortar, unless otherwise indicated.
- D. 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.
 - a. Add mortar pigments to produce mortar colors required.
- E. Rebuilding Mortar: Comply with ASTM C 270, Proportion Specification, Type N, unless otherwise indicated; with cementitious material content limited to Portland cement and lime.

2.5 CLEANING MATERIALS

- A. Water for Cleaning: Clean, potable, free of soils, acids, alkalis, salts, and organic matter.
- B. Hot Water: Heat water to a temperature of 140 to 160 deg F.
- C. Brushes: Fiber bristles only.

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.
- D. Coordinate masonry restoration and cleaning with circulation patterns at Project site. Circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the work accordingly.

3.2 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. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 2. Clean masonry surfaces.
 - 3. Where water repellants, specified in Division 07, are to be used on or near masonry work, delay application of these chemicals until after pointing.
 - 4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 - 5. Repair masonry, including replacing existing masonry with new masonry materials.
 - 6. Rake out mortar from joints to be repointed.

7. Point mortar and sealant joints.
 8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
 9. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 10. Clean masonry surfaces.
- C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

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 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 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.

3.5 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 gages.
 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. 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.
- E. 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.
- F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting.

MASONRY RESTORATION AND CLEANING

3.6 CLEANING BRICKWORK

- A. Cold-Water Wash: Clean brick masonry with cold water applied as follows:
 - 1. Low-pressure spray. Do pressure wash.
- B. Acidic Chemical Cleaning: Clean brick masonry with an acidic cleaner applied as follows:
 - 1. Wet masonry with cold water applied by low-pressure spray.
 - 2. Apply cleaner to masonry. Let cleaner remain on surface for period indicated below:
 - a. As recommended by chemical cleaner manufacturer.
 - b. 2 to 3 minutes.
 - 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.

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 04 01 20