

SECTION SS 044300
STONE MASONRY RESTORATION

**PART 1 GENERAL****1.01 WORK INCLUDES**

- A. Reconstruction of the north parapet.
- B. Retrofit of the south parapet.
- C. Restoration of the south parapet coping stones and pier capstones.
- D. Selective repointing where removal of existing stone repairs is specified.

1.02 RELATED REQUIREMENTS

- A. Requirements for Drawings, General and Supplementary Conditions and Division 1 Specification sections apply to this section.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Refer to Part 4 of this section for information on price and payment procedures.

1.04 REFERENCE STANDARDS

- A. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications; 2016.
- B. ASTM A194 - Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both; 2016.
- C. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes; 2016
- D. ASTM A1022 - Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement; 2016.
- E. ASTM C91 - Standard Specification for Masonry Cement
- F. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011
- G. ASTM C150 - Standard Specification for Portland Cement; 2011
- H. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes
- I. ASTM C270 - Standard Specification for Mortar for Unit Masonry
- J. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015
- K. ASTM C1384 Standard Specification for Admixtures for Masonry Mortars

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature, including surface preparation and installation instructions for all products to be used. Include manufacturer's published data and certifications indicating that the materials comply with the specification requirements.
- B. Submit proposed mortar mix proportions, including admixtures.
- C. Samples:
 - 1. Submit 1-gal ziplock plastic bag full each mortar component, properly labeled and identifying the component source. Do not proceed with field mock-ups until materials have been approved.

2. Limestone samples consisting of three stones not less than 12" x 12" x 4". Samples shall show a range of variations in color and grain to be expected in completed work.
- D. Qualification Data: Submit documented work experience for masonry firm/persons to demonstrate their capabilities and experience.

1.06 QUALITY ASSURANCE

- A. Masonry firm qualifications: Engage an experienced masonry firm having at least 5 years of documented experience in the work of the type specified and with a record of successful performance.
- B. Crew members performing the work shall be the same for the entirety of the project. The crew shall not be rotated.
- C. Single-Source Materials: Obtain materials for masonry restoration from a single source for each type of material required (e.g. stone, cement, sand, etc.) to ensure a consistency of quality, color, pattern and texture.

1.07 MOCK-UPS

- A. Provide one field mock-up of masonry reconstruction to demonstrate aesthetic effects and qualities of material and execution. Use only materials and methods approved for the completed work. Cure mock-up for 14-days minimum before obtaining review for acceptance.
- B. Prepare mock-ups of two (2) anchor rod installations demonstrating the approved methods and materials. The Engineer shall be on-site to observe the preparation and anchor rod grouting procedures in their entirety.
- C. Mock-ups may remain as part of the Work, if the function and appearance of the mock-ups is acceptable to the Architect, Engineer and Owner. Changes to the methods or materials may be required as a result of the mock-ups.

1.08 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.

1.09 PROJECT CONDITIONS

- A. 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 , 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.

4. Work shall not commence when rain, snow, or below-freezing temperatures are expected within the next 24 hours.
 5. All surfaces shall be free of standing water, frost, and ice.
- B. 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. Use chilled water or ice for mixing. Keep area shaded until mortar has cured for at least 72 hours. After final set, spray area of repointing with a fine mist at least three times a day or more to prevent drying for 72 hours. Curing blankets, tarps or plastic may be placed over the area of work to prevent the mortar from drying. Do not apply mortar to substrates with temperatures of 90 deg F and above.
- C. 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.
- D. Protect sills, ledges, and projections from mortar droppings.

PART 2 PRODUCTS

2.01 MATERIALS – STONE

- A. Provide new-quarried limestone with color, density, surface texture, size, shape, and hand-tooling to match existing stone work.

2.02 MATERIALS – MORTAR

- A. Portland Cement (white and gray): ASTM C 150, Type I or II, low alkali content, non-staining. Mixing of gray and white cement is allowed to alter the color of the binder.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Fly Ash: ASTM C 618, Class C or Class F
- D. Aggregate for Mortar: ASTM C 144, unless otherwise indicated.
1. Natural sand, clean, sound, and washed selected to produce mortar color indicated.
 2. Match size, texture, and gradation of existing mortar sand as closely as possible.
- E. Water: Clean and Potable.

2.03 MATERIALS – GROUT

- A. Grout for anchor rod installation shall comply with TxDOT DMS-4675
- B. Grout for horizontal bond beams shall comply with TxDOT DMS-4655, Type D
- C. Requests for site mixed or pre-packaged grout substitutions must be submitted to the engineer for approval.

2.04 MATERIALS – ANCHOR RODS & ACCESSORIES

- A. Rods: ASTM A 193 Grade B8, threaded each end
- B. Sleeve nuts: ASTM A 194, compatible with the anchor rods.
- C. Washers: Commercial stainless steel washers compatible with specified anchor rods and nuts.
- D. Wire reinforcement: ASTM A1022, size as indicated on the drawings
- E. Stone anchors and attachments: Stainless Steel, AISI Type 304 or 316 for anchors and expansion bolts embedded within the stone.

2.05 MORTAR MIXES

- A. General: Do not add mixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds, or calcium chloride, unless otherwise indicated.
- B. Measurement: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure.
- C. Mixing: Combine and thoroughly mix cementitious materials, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standard for mixing time and water content, unless otherwise indicated.
- D. Setting Mortar: Comply with ASTM C 270, Proportion Specification, Type N, unless otherwise indicated.
- E. Trial Repointing Mortar: 1 part Portland: 1 parts lime: 5 parts aggregate to match original mortar.
- F. Brightness of the binder can be reduced by increasing the portion of gray to white cement or by adding Fly Ash.

PART 3 EXECUTION

3.01 GENERAL

- A. Miscellaneous Metal Removal: As necessary, drill out ferrous surface fasteners, anchors, or pins with a core drill bit size only slightly larger than the fastener to be removed. Remove corrosion, staining and debris from the surrounding stone as specified elsewhere in this document. Patch drill outs as specified.
- B. Removal of previous stone coping repairs: Remove existing stone repairs where coping is not original, as indicated on the drawings.

3.02 ANCHOR ROD INSTALLATION

- A. Vertical rod coring: Core holes for vertical anchor rods using a diamond core bit of the appropriate diameter and length. Dry or wet coring is permissible. Holes should be located in the center of the walls thickness and equally spaced along the length of the wall as described in the drawings.
- B. Horizontal rod preparation: Sawcut the masonry to dimensions indicated on the drawings to create a continuous, longitudinal bond beam at the top of the parapet.
- C. Prior to grouting, the holes should be thoroughly flushed with water to remove debris from drilling and to saturate the masonry. The holes should be flushed using a water hose fitted with a tube of a size to fit the hole. Place the tube all the way into the hole and flush for 5-seconds. Assure that the hole is clear of debris. If necessary, re-drill and flush again. If the wall is allowed to dry out before the grout is injected, immediately before injection, re-moisten by lightly flushing with water.
- D. Mix pre-packaged grout in accordance with the manufacturer's recommendations.
- E. The grouting should be done by mixing to a flowable consistency and pouring, with the anchor rod fully inserted, until the hole is grouted. Prevent the rods from displacement until the grout has cured.
- F. Hold back vertical rod grouting to just below the bottom of the longitudinal bond beam. Place the bond beam grout in one continuous pour.
- G. Estimate the quantity of grout required and compare to the amount used for each hole filled.
- H. Inspection: Anchor rod installation must be witnessed by a qualified inspector continuously during the work.

3.03 SETTING STONE

- A. Set stones to comply with requirements indicated on drawings. Install anchors rods, reinforcement(s), fasteners and other attachments indicated or necessary to secure stonework in place. Shim and adjust anchors and accessories to set stones accurately in locations indicated with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.
- B. Finish tool all rebuilt work to match original joint detail and to blend fully with adjoining areas.

3.04 CLEAN-UP

- A. Keep stone faces free of excess mortar, grouts, adhesives, and dirt. Clean stone immediately after repairs are complete.
- B. Do not use wire brushes to clean masonry.
- C. Do not use acidic cleaners.

3.05 PROTECTION OF FINISHED WORK

- A. Protect masonry from damage or staining until substantial completion or acceptance by the Engineer.

PART 4 - PAYMENT**4.01 PAYMENT**

- A. Masonry restoration work shall be paid for as a lump sum. Work shall include full compensation for providing all labor, material, coordination, tools, equipment and incidentals necessary to complete the work.
- B. Payment will be made under:
 - 1. Pay Item No SS 044300: Stone Masonry Restoration.

END OF SECTION