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MORTAR-SET STONE VENEER – SECTION 04 42 10

PART 1 GENERAL

1.1 Section Includes

- A. Section includes non-load bearing, full width dimensional stone veneer set in cement mortar and tied to a structural back-up wall including mortar, wall ties, weep system, special stone shapes, and installation of [plywood sheathing,] [gypsum sheathing,] [waterproof underlayment,] [vapor barrier underlayment,] [ridge board thermal insulation,] [and] [water repellent and anti-graffiti coating].
- B. Section includes special decorative cut stone shapes for trim.

1.2 Related Sections

- A. Section 03 30 00 - Cast-In-Place Concrete: Concrete foundations.
- B. Section 04 22 00 - Concrete Unit Masonry Assemblies: Masonry supporting wall.
- C. Section 05 40 00 - Cold-Formed Metal Framing: Formed steel framed supporting wall.
- D. Section 05 50 00 Metal Fabrications: Lintels, shelf angles, structural supports, anchors and other built-in components for building into stone masonry by this section.
- E. Section 06 10 00 - Rough Carpentry: [Structural wood stud wall framing] [and] [plywood sheathing] for supporting wood veneer.
- F. Section 07 13 26 - Self-Adhering sheet Waterproofing: Self-adhering sheet membrane applied as part of this section to [plywood sheathing] [gypsum sheathing] [_____] as moisture barrier underlayment from stone veneer wall.
- G. Section 07 21 00 - Thermal Insulation: Rigid board thermal insulation installed in exterior stone wall assembly.
- H. Section 07 62 00 - Sheet Metal Flashing and Trim.
- I. Section 07 92 00 - Joint Sealers: Sealant for perimeter and control joints.
- J. Section 09 21 16 - Gypsum Board Assemblies: Gypsum sheathing substrate for stone veneer wall.
- K. Section 09 24 00 - Portland Cement Plaster: Metal lath and scratch coat back-up supporting walls.
- L. Section 09 96 24 - Water Repellent and Anti-Graffiti Coating: Clear coating applied to stone veneer to prevent water penetration and simplify

graffiti removal.

1.3 References

- A. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM A580 - Standard Specification for Stainless Steel Wire.
- C. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM C79 - Treated Core and Nontreated Core Gypsum Sheathing Board.
- E. ASTM C91 - Standard Specification for Masonry Cement.
- F. ASTM C97 - Standard Specification for Absorption and Bulk Specific Gravity of Dimension Stone.
- G. ASTM C144 - Aggregate for Masonry Mortar.
- H. ASTM C150 - Standard Specification for Portland Cement.
- I. ASTM C170 - Standard Specification for Compressive Strength of Dimension Stone.
- J. ASTM C207 - Hydrated Lime for Masonry Purposes.
- K. ASTM C270 - Mortar for Unit Masonry.
- L. ASTM C476 - Grout for Masonry.
- M. ASTM C568 - Standard Specification for Limestone Dimension Stone.
- N. ASTM C615 - Standard Specification for Granite Dimension Stone.
- O. ASTM C616 - Standard Specification for Quartz-Based Dimension Stone.
- P. ASTM C 629 - Standard Specification for Slate Dimension Stone.
- Q. ASTM C780 - Preconstruction Evaluation of Mortar for Plain and Reinforced Masonry.
- R. ASTM C880 - Standard Specification for Flexural Strength of Dimension Stone.
- S. ASTM D226 - Asphalt Saturated Organic Felt used in Roofing and Waterproofing.
- T. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- U. ASTM D4632 - Standard Test Method Grab Breaking Load and Elongation of Geotextiles.
- V. ASTM D4632 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
- W. ASTM E96 - Standard Test Method for Water Vapor Transmission of Materials.
- X. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures.
- Y. ACI 530.1/ASCE 6/TMS 602 - Specifications for Masonry Structures.
- Z. National Concrete Masonry Association TEK 8-2A for masonry cleaning.

1.4 System Description

- A. Design Requirements: Perform work in accordance with ACI 530/ASCE 5/TMS 402 Building Code Requirements for Masonry Structures, ACI 530.1/ASCE 6/TMS 602 Specifications for Masonry Structures, and the applicable Building Code.

1.5 Submittals

- A. Submit under provisions of Section 01 33 00.
- B. Product data for natural dimensional stone, mortar design, wall ties, weep system, and accessories.
- C. Shop drawings for layout of stone veneer work illustrating coursing and pattern details for installation of wall ties, built-in items, flashing, weep system, window and door openings, penetrations, control joints, and joints with adjacent materials.
- D. Copies of test reports or certificates showing compliance with specified requirements.
- E. Selection Samples: For each stone product specified, submit two samples, minimum size [6 inches] [152 mm] long, representing color range, surface, and texture.
- F. Mortar Samples: [1/2 by 4 inches] [13 by 102 mm] minimum, illustrating selected color.
- G. Weep system material: [4 by 4 inches] [102 by 102 mm] minimum size.
- H. Construct sample panel at location indicated or directed, and as follows:
 - 1. Recommended Size: 8 feet by 8 feet (2.4 m by 2.4 m) or a size that satisfies the architect. This size should be no less than 4 feet x 4 feet (1.2 m by 1.2 m).
 - 2. Include all stone unit types and sizes to be used including a typical corner condition, special shapes, and mortar joint treatment. Clean the sample panel using the same materials and tools as planned for the final stone masonry construction.
 - 3. Obtain architect's acceptance of sample panel before beginning construction activities of this section.
 - 4. Do not remove sample panel until construction activities of this section have been accepted by the Architect.

1.6 Quality Assurance

- A. Manufacture's qualifications: Company owning and operating stone quarry and specializing in quarrying, cutting, and dressing natural stone for masonry assemblies with 5 years minimum documented, successful experience.
- B. Installer qualifications: Company specializing in performing stone masonry work with 5 years documented, successful experience.

1.7 Mock-Up

- A. Quality Control: prepare mock-up of stone veneer wall illustrating color, finish, texture, joints, construction method, and workmanship quality and to establish standard of quality for completed work.
- B. Mock-Up shall be building corner [with [window] [door] opening] illustrating stone veneer and mortar combinations, coursing, and pattern. Mock-up shall be constructed with:
 - 1. Stone veneer as specified in this Section.
 - 2. Mortar, grout, wall ties, and weep system specified in this section.
 - 3. Structural supporting wall as specified in Section [____].
 - 4. [Sheathing,] [Underlayment,] [Rigid board thermal insulation,] and other specified accessories.

5. [Clear sealer and anti-graffiti coating.]
- C. Size: approximately [4 feet] [1.2 m] [_____] high by [4 feet] [1.2 m] [_____] long.
- D. Provide slab or foundation support as required by size of mock-up.
- E. Testing: Use water hose to test completed mock-up for water resistance and performance of weep system.
- F. Obtain Architect's approval of mock-up prior to beginning stone veneer installation.
- G. Retain mock-up during construction as quality standard. Completely remove when work is acceptable.

1.8 Pre-Installation Conference

- A. Project Management and Coordination: Convene a pre-installation conference at the site prior to commencing masonry veneer.
- B. Require attendance of entities directly concerned with exterior wall construction and masonry veneer.
- C. Review at meeting:
 1. Erection and removal of scaffolding.
 2. Protection of non-masonry building surfaces and adjacent elements.
 3. Installation procedures and manufacturer's recommendations.
 4. Availability of system materials.
 5. Preparation and acceptance of substrate.
 6. Protection of installed items and finishes.
 7. Approved mock-up to be used as measure of acceptance.
 8. Weather conditions forecast.
 9. Other items related to successful execution of work.

1.9 Handling

- A. Deliver, store, and handle stone units in a manner to avoid chipping, breakage, marring faces, and contact with contaminating materials.
- B. Store stone on wood pallets and store on dry, level surface. Cover pallets with tarps. Do not stack pallets or allow them to sit in standing water.
- C. Store mortar and cementitious materials in dry, weathertight enclosures with temperature maintained between [40 degrees F] [4 degrees C] to [110 degrees F] [43 degrees C].

1.10 Environmental requirements

- A. Maintain materials and surrounding air temperature to following limits prior to, during, and 24 hours after completion of masonry veneer [and application of water repellent coating]:
 1. Minimum [40 degrees F] [4 degrees C]
 2. Maximum [90 degrees F] [32 degrees C]
- B. Hot and Cold Weather Requirements: In accordance with ACI 530.1/ASCE 6/TMS 602 Specifications for Masonry Structures.
- C. When ambient temperature falls below [50 degrees F] [10 degrees C], heat mortar mixing water.

PART 2 PRODUCTS

2.1 Acceptable Manufacturers

- A. Acceptable Stone Quarrier: Buechel Stone Corporation
800.236.4473
www.buechelstone.com
- B. [Requests for substitutions will be considered in accordance with provisions of Section 01 25 13 - Product Substitution Procedures: Architect reserves the right to reject substitution requests based on natural stone color and texture, even though size, shapes, and properties are equivalent.] [Substitutions are not acceptable.]

2.2 Veneer Stone

- 1. Highland Scotch Ashlar
 - a. Nominal size range:
 - 1) Length: [6 to 24 inches] [152 to 609 mm]
 - 2) Height: [1/2 to 6 inches] [13 to 152 mm]
 - 3) Width: [4 to 6 inches] [102 to 152 mm]
 - b. Color range: buffs, tans, golds, oranges, browns, grays, yellows, rusts, and whites with occasional burgundy and black
 - c. Color consistency: somewhat consistent
 - d. Ends: squares
 - e. Properties for granite complying with ASTM C615:
 - 1) Maximum absorption rate tested in accordance with ASTM C97: 0.40 percent.
 - 2) Minimum density tested in accordance with ASTM C97: 2,560 kg per cubic meter.
 - 3) Minimum compressive strength tested in accordance with ASTM C170: 131 Mpa.

2.3 Special Shapes

- A. Provide shapes as indicated on the Drawings and as follows:
 - 1. [Arches]
 - 2. [Cornerstones]
 - 3. [Edgestones]
 - 4. [Headers]
 - 5. [Keystones]
 - 6. [Quoins]
 - 7. [Ledges]
 - 8. [Medallions]
 - 9. [Sills]
 - 10. [Other _____]
- B. Material shall be furnished in sizes indicated plus or minus [1/2 inch] [12 mm].
- C. Color shall be:
 - 1. [Bluestone]
 - 2. [Caramel Frappuccino]

3. [Chestnut]
4. [Chilton]
5. [Desert]
6. [Fond du Lac]
7. [Frontier Gray]
8. [Indiana Buff]
9. [Mill Creek]
10. [Rustic Buff]
11. [Prairie Dust]
12. [Silverdale]
13. [Smoked Fog]
14. [Spiced Linen]
15. [St. Croix]
16. [St. Mary Cream]
17. [Texas Cream]
18. [Match the veneer stone]
19. [_____]

2.4 Weep System

- A. Provide complete weep system to separate stone veneer from structural back-up wall and provide means to remove water entering air cavity and allow wall to vent properly; [EMC 3639] [EMC-3639XL] Weep System by Buechel Stone Corporation.
- B. System Components: Fabricated from plastic extrusions
 1. Collection and drainage membrane: corrugated plastic sheet with permeable fabric facing to be placed vertically and continuously behind stone veneer on structural back-up. [EMC 3639] [EMC-3639XL] by Buechel Stone Corporation.
 2. Weeps: Cellular plastic material placed at base of stone veneer wall to receive water from collection and drainage membrane and convey it horizontally to weep strips spaced at [16 inches] [406 mm] [_____] and penetrating through base mortar bed; [SCW-3639] **OR** [WOW-3639] by Buechel Stone Corporation.
 3. Material properties:
 - a. Water vapor transmission tested in accordance with ASTM E96: 13.8 grains per hour per square foot.
 - b. Permeability tested in accordance with ASTM E96: 13.7 perm-inches.
 - c. Compressive strength tested in accordance with ASTM D1612: 30 PSI at 10 percent strain.
 - d. Flexural breaking load tested in accordance with ASTM D4632: 136 pounds minimum
 - e. Puncture resistance tested in accordance with ASTM D4833: 48.7 pounds.

2.5 Reinforcement and Wall Ties

- A. Reinforcing bars: [ASTM A615 (S1), 60 ksi yield grade.] [As specified in Section _____]
- B. Joint reinforcement: Truss type, cold-drawn steel conforming to ANSI/ASTM A82, 9 gauge minimum side and cross rods.
- C. Masonry anchors: Formed from [22 gauge ASTM A153 galvanized steel wire] [22 gauge ASTM A580 stainless steel wire].

1. Adjustable eye and pintel type with rectangular wire shape and hook connection for non-aligned mortar joints.
2. Bent strap anchors, [1 1/4 inches] [32 mm] wide, length as required.

2.6 Mortar

- A. Mortar Cement: Complying with ASTM C91:
 1. Type S
 2. Color [gray] [white] [_____]
- B. Portland Cement: Complying with ASTM C150:
 1. Type I
 2. Color [gray] [white] [_____]
- C. Mortar Aggregate: Complying with ASTM C144, standard masonry type.
- D. Hydrated Lime: Complying with ASTM C207:
 1. Type S
 2. Type SA
- E. Water: Clean and potable.
- F. Mortar mix: ASTM C270 [1,000] [_____] PSI Type S using the Property Method.
- G. Color: Mineral oxide pigment. Color as selected by Architect.
- H. Mix mortar ingredients in accordance with ASTM C270. Mix only in quantities needed for immediate use.
 1. Do not use anti-freeze compounds.
 2. Use mortar within two hours after mixing.

2.7 Accessories

- A. Substrate: [CDX exterior grade plywood] [Plywood as specified in Section 06 10 00 – Rough Carpentry] [Moisture resistant gypsum sheathing complying with ASTM C79] [Gypsum sheathing as specified in Section 09210 – Gypsum Board Assemblies].
 1. Thickness: [[1/2] [5/8] [3/4] inch] [[13] [16] [19] mm].
- B. Underlayment: [Cold applied, self-adhering waterproof membrane composed of polyethylene film coated one side with rubberized asphalt adhesive] [30 pounds unperforated asphalt saturated felt complying with ASTM D226.] [_____].
- C. Setting buttons and shims: Plastic.
- D. Flashings: Provide [copper] [galvanized sheet metal] [stainless steel] [self-adhered rubber] [_____] flashing for base of air cavity, at door and window lintels, window sills, and other locations as detailed on Drawings and reviewed shop drawings and as required to prevent water penetration and provide weathertight, complete, functional stone veneer installation.
 1. Type: [_____] [As specified in Section 07 62 00 – Flashing and Sheet Metal.]
- E. Sealants: Provide sealants and backing material for perimeter and control joints as detailed on Drawings and reviewed shop drawings and as required to provide a weathertight stone veneer installation.
 1. Type: [_____] [As specified in Section 07 92 00 – Joint Sealants.]

PART 3 EXECUTION

3.1 Preparation

- A. Coordinate installation of stone with installation of other components to ensure timely execution of work and sequencing and to ensure sound, attractive, weather tight exterior wall system.
- B. Prior to starting installation, inspect project conditions:
 - 1. Verify that back-up wall construction is complete, rigid, plumb, and ready to receive stone.
 - 2. Verify that door and window openings and other penetrations are accurately located and fixed and adequately prepared for application of stone veneer.
 - 3. Verify built-in items are properly located and ready for roughing into masonry. Ensure built-in items are free of rust, ice, mud, and other foreign matter and that ferrous items are primed or galvanized.
 - 4. Verify that mechanical and electrical services within walls have been installed, tested, and approved.
 - 5. Verify that [plywood] [gypsum] sheathing substrate is:
 - a. Securely installed with ends and edges over firm bearing.
 - b. Clean, dry, smooth, free of voids, sharp edges, loose splinters, oil, grease, and other materials.
 - 6. Verify fasteners are flush with surface of substrate.
- C. Report deficiencies to Architect and do not proceed with stone installation until all deficiencies have been addressed.

3.2 Installation

- A. Install masonry and mortar in accordance with ACI 530.1/ASCE 6/TMS 602 Specifications for Masonry Structures.
- B. Underlayment: Install [asphalt felt underlayment] [self-adhered waterproofing underlayment] on wall substrate in accordance with manufacturer's instructions.
 - 1. Start installation at bottom of wall. Install underlayment horizontally with [4 inches] [102 mm] minimum side laps and [6 inches] [152 mm] minimum end laps.
 - 2. Do not leave underlayment exposed for lengthy period. Exercise care not to puncture or tear underlayment.
- C. Rigid board thermal insulation board: [Mechanically attached] [adhesive apply] insulation specified in Section 07 21 00 – Thermal Insulation to [concrete unit masonry wall] [cast concrete wall] [stud and sheathing wall framing] [____]. Total thickness of rigid thermal insulation shall be [[____] [inches] [mm].] [as required to provide minimum r value of [19.00] [____].] [as indicated on Drawings.]
- D. Flashing: Install flashing at base of air cavity, at door and window lintels, window sills, and other locations as detailed on Drawings and reviewed shop drawings in accordance with Section 07 62 00 – Flashing and Sheet Metal.
- E. Install weep system in accordance with manufacturer's instructions and reviewed shop drawings.

1. Apply collection and drainage membrane in air cavity over complete back-up wall. Where sections join, overlap fabric facing.
 2. At base of air cavity and anchor weeps – space at [16 inches] [406 mm] minimum and extend through stone veneer. After installation of stone, cut off excess weep material flush with stone edge.
- F. Stone installation:
1. Layout work area in advance and distribute color range of stone uniformly over total work area.
 2. Coursing patterns: [Coursed] [Random Ashlar] [Free Form] [Random rubble] [Squared rubble] [As indicated on [Drawings] [reviewed shop drawings]] [To match approved mock-up]. Arrange stone pattern to provide color and uniformity, visual variations, blend of sizes, and regularity and neat appearance of joints. Exercise care to avoid concentration of any one color on any one wall surface. Do not use stacked vertical joints.
 3. Wall ties: Anchor stone veneer to back-up wall with wall ties as required to meet regulations of authorities having jurisdiction at Project site. As a minimum place ties as follows:
 - a. Provide one tie per [2 square feet] [0.19 square meter] of wall surface.
 - b. Space ties at [16 inches] [406 mm] minimum vertically and [32 inches] [813 mm] horizontally. Provide additional ties within [12 inches] [305 mm] of openings.
 - c. Embed ties in horizontal joints to depth of [2 inches] [51 mm] minimum.
 4. Joints: Lay stone with [1/2 inch] [12 mm] approximate mortar joints.
 - a. Fill joints with grouting mortar. Pack and work into voids.
 - b. When thumb-print hard, neatly tool surface to concave joint with round jointer slightly larger than joint width.
 - c. If a drystack installation is desired, stone shall be laid tight to one another as the stone will naturally allow.
- G. Remove excess mortar as work progresses to prevent staining.
- H. Remove units disturbed after laying, clean, and relay with fresh mortar. If adjustments are required, remove units, clean off mortar, and reset with fresh mortar.
- I. Exercise care that wet mortar is not splashed onto stone face during installation. Excess or splashed mortar shall be cleaned from face with dry burlap wipe. Remove excess mortar after mortar becomes hard enough not to smear but prior to mortar setting.
- J. Ensure that sealant materials are not smeared onto stone faces. Remove as recommended by manufacturer.
- K. Joining Work: Where fresh masonry joins partially set masonry.
1. Remove loose stone and mortar.
 2. Clean and lightly wet surface of set masonry.
 3. To avoid a horizontal run of masonry, rack back 1/2 the length of stone in each course.
 4. Toothing is not permitted.

3.3 Field Quality Control

- A. Test mortar and grout in accordance with Section 01 45 00 - Quality

Control and ASTM C780.

- B. Testing of Mortar Mix: In accordance with ASTM C780, Annex A4, for mortar aggregate ratio and ASTM C780, Annex A5, for mortar water content.

3.4 Protection

- A. Protect installed products until completion of project.
- B. Cover the top of unfinished stone masonry work at the end of each workday to protect it from the weather.
- C. Touch-up, repair or replace damaged products before substantial completion.

3.5 Cleaning and Sealing

- A. Remove excess mortar and mortar smears as work progresses.
- B. Allow walls to air dry. Brush off mortar with stiff fiber brush. Do not use metallic tools for cleaning.
- C. Review www.buechelstone.com for detailed cleaning if chemicals are required.
- D. After cleaning, treat exposed stone surfaces and mortar joints with clear water repellent [and anti-graffiti] coating [____]. Apply in accordance with manufacturer's instructions. Verify surfaces are clean and thoroughly dry prior to application.
- E. Review www.buechelstone.com for details on sealing stone.

END OF SECTION