

**SECTION 04 72 00  
CAST STONE MASONRY**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies manufactured concrete units to simulate a natural stone.
- B. Installation of cast stone units.
- C. Provide materials and labor of this section as required for exterior wall mock-up specified in Section 04 20 00, UNIT MASONRY.

**1.2 RELATED WORK**

- A. Setting and pointing mortar: Section 04 05 13, MASONRY MORTARING.
- B. Joint sealant and application: Section 07 92 00, JOINT SEALANTS.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
  - 1. Cast stone, sample panel, size 100 by 300 by 300 mm (4 by 12 by 12 inches) showing color and finish.
  - 2. Show finish on two 100 mm (4-inch) edges and 300 by 300 mm (12 by 12 inch) surface.
- C. Shop Drawings:
  - 1. Cast stone showing exposed faces, profiles, cross sections, anchorage, reinforcing, jointing and sizes.
  - 2. Setting drawings with setting mark.
- D. Certificates: Test results indicating that the cast stone meets specification requirements and proof of plant certification.
- E. Manufacturers test results of cast stone previously made by manufacturer.
- F. Laboratory Data: Description of testing laboratories facilities and qualifications of its principals and key personnel.
- G. List of jobs furnished by the manufacturer, which were similar in scope and at least three (3) years of age.

**1.4 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Store cast stone under waterproof covers on planking clear of ground.
- B. Protect from handling, dirt, stain, and water damage.
- C. Mark production units with the identification marks as shown on the shop drawings.
- D. Package units and protect them from staining or damage during shipping and storage.

E. Provide an itemized list of product to support the bill of lading.

**1.5 APPLICABLE PUBLICATIONS**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. Cast Stone Institute Technical Manual and Cast Stone Institute standard specifications.
- C. American Concrete Institute (ACI):
  - 318-08.....Building Code Requirements for Structural Concrete
- D. American Society for Testing and Materials (ASTM):
  - A615/A615M-08.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  - C33-07.....Concrete Aggregates
  - C150-07.....Portland Cement
  - C503-08.....Marble Dimension Stone (Exterior)
  - C568-08.....Limestone Dimension Stone
  - C615-03.....Granite Dimension Stone
  - C616-08.....Quartz-Based Dimension Stone
  - C979-05.....Pigments for Integrally Colored Concrete
  - C1194-06.....Compressive Strength of Architectural Cast Stone
  - C1195-03.....Absorption of Architectural Cast Stone
  - C1364-07.....Architectural Cast Stone.
  - D2244-07.....Calculation of Color Differences from Instrumentally Measured Color Coordinates.

**1.6 QUALITY ASSURANCE**

- A. Manufacturer:
  - 1. Must have five (5) years minimum continuous operating experience and have facilities for manufacturing cast stone as described herein. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of cast stone required in accordance with the project schedule.
  - 2. Must be a member of the Cast Stone Institute.
  - 3. Must have a certified plant (certification by the Cast Stone Institute).
- B. Stone setter: Must have five (5) years experience setting cast or natural building stone.
- C. Testing: One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14 m<sup>3</sup>) delivered to the job:

1. Three (3) field cut cube specimens from each of these sample shall have an average minimum compressive strength of not less than 85% of design strength with no single specimen testing less than 75% of design strength as specified.
2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.
4. Manufacturer shall submit a written list of projects similar and at least three (3) years of age, along with owner, architect and contractor references.

#### **1.7 MANUFACTURING TOLERANCES**

- A. Cross section dimensions shall not deviate by more than + 1/8 in. (3 mm) from approved dimension.
- B. Length of units shall not deviate by more than length/360 or 1/8 inch (3mm), whichever is greater, not to exceed + 1/4 inch(6 mm). Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- C. Warp bow or twist of units shall not exceed length/360 or 1/8 inch (3 mm), whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features
  1. On formed sides of unit, 1/8 inch (3 mm)
  2. On unformed sides of unit, 3/8 inch (9 mm) maximum deviation.

#### **1.8 MOCK-UP**

Provide full size unit(s) for use in construction of brick sample panel. The mock-up becomes the standard of workmanship for the project.

### **PART 2 - PRODUCTS**

#### **2.1 ARCHITECTURAL CAST STONE**

- A. Comply with ASTM C 1364
- B. Physical properties: Provide the following:
  1. Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.
  2. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products as 28 days.
  3. Air Content - ASTM C173 or C231, for wet cast product shall be 4-8%. Air entrainment is not required for vibrant dry tamp (VDT) products.

4. Freeze thaw - ASTM C 1364 The cumulative percent weight loss (CPWL) shall be less than 5% after 300 cycles of freezing and thawing.
5. Linear Shrinkage - ASTM C 426 Shrinkage shall not exceed 0.065%.
- C. Job site testing - One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14m<sup>3</sup>) delivered to the job site:
  1. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
  2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
  3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

## 2.2 RAW MATERIALS

- A. Portland cement - Type I or Type III, white and/or grey, ASTM C 150.
- B. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the vibrant dry tamp (VDT) casting method.
- C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.
- D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
- E. Admixtures- Comply with the following:
  1. ASTM C 260 for air-entraining admixtures.
  2. ASTM C 494/C 495 M Types A-G for water reducing, retarding, accelerating and high range admixtures.
  3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
  4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
  5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.
- F. Water - Potable
- G. Reinforcing bars:
  1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in. (37 mm).

- H. Anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as galvanized steel or stainless steel Type 302 or 304.

### **2.3 COLOR AND FINISH**

- A. Color and Texture: Match Edwards Stone, 19-019.
- B. All surfaces exposed to view shall have no air voids in excess of 1/32 inch (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 square inch (25 mm<sup>2</sup>) and not obvious under direct daylight illumination at a 5 foot (1.5 m) distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 foot (3m) distance.
- D. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
1. Total color difference: not greater than 6 units.
  2. Total hue difference: not greater than 2 units.

### **2.4 REINFORCING**

- A. Reinforce the units as required by the shop drawings and for safe handling and structural stress.
1. Minimum reinforcing shall be 0.25 percent of the cross section area.
- B. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1-1/2 inches (38 mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- C. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20 feet (6m) distance.
- D. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- E. Remove cement film, if required, from exposed surface prior to packaging for shipment.

### **2.5 CURING**

- A. Cure units in a warm curing chamber 1000 F (537.8 C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 700F (371.1 C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350-degree-days (i.e. 7 days @ 500F (260.0 C) or 5 days @ 700F (371.1 C) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Installing contractor shall check cast stone materials for fit and finish prior to installation. Do not set unacceptable units.

**3.2 SETTING TOLERANCES**

- A. Comply with Cast Stone Institute <sup>SM</sup> Technical Manual.
- B. Set stones 1/8 inch (3 mm) or less within the plane of adjacent units.
- C. Joints, plus 1/6 inch (1.5 mm), minus 1/8 inch (3 mm).

**3.3 JOINTING**

- A. Joint size: 3/8 inch (9.5 cm).
- B. Joint Materials: Mortar, Type N, ASTM C 270.
- C. Use a full bed of mortar at all bed joints.
- D. Flush vertical joints full with mortar.
- E. Leave all joints with exposed tops open for sealant.
- F. Leave head joints in coping and projecting components open for sealant.
- G. Location of joints:
  - 1. As shown on shop drawings.
  - 2. At brick expansion joints.

**3.4 SETTING**

- A. Drench units with clean water prior to setting.
- C. Set units in full bed of mortar, unless otherwise detailed.
- D. Rake mortar joints 3/4 inch (18 mm) for pointing.
- E. Remove excess mortar from unit faces immediately after setting.
- F. Tuck point unit joints to a slight concave profile.

**3.5 JOINT PROTECTION**

- A. Comply with requirements of Section 07 92 00, JOINT SEALANTS.
- B. Prime ends of units, insert properly sized backing rod and install required sealant.

**3.6 REPAIR AND CLEANING**

- A. Repair chips with touchup materials furnished by manufacturer.
- B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
- C. Consult with manufacturer for appropriate cleaners.

**3.7 INSPECTION AND ACCEPTANCE**

- A. Inspect finished installation according to Bulletin #36 published by the Cast Stone Institute.

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