

SECTION 04 72 00
CAST STONE MASONRY
(DEDUCT OPTION)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section shall only be applicable if the owner executes the deduct alternate option to replace the natural stone cap elements with cast stone.
- B. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- C. This section specifies manufactured concrete units to simulate a natural stone.
- D. Installation of cast stone units:
 - 1. Caps for Columbaria niche units
 - 2. Caps for Walls and Piers/columns
 - 3. Caps for Memorial walls and units
 - 4. Caps for ossuary privacy wall
 - 5. Caps for benches

1.2 RELATED WORK

- A. Setting and pointing mortar: Section 04 05 13, MASONRY MORTAR.
- B. Joint sealant and application: Section 07 92 00, JOINT SEALANTS.
- C. Mockups: Section 01 43 39, MOCKUP REQUIREMENTS
- D. Shop drawings: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- E. Sustainable requirements: Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS
- F. General requirements: Section 01 00 00, GENERAL REQUIREMENTS

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) each 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. Submit 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 WARRANTY

Warranty exterior masonry walls against moisture leaks, any defects and subject to terms of "Warranty of Construction" article in Section 00 72 00, GENERAL CONDITIONS, except that warranty period shall be five years.

1.6 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 04720 and Cast Stone Institute standard specification (2004).
- C. American Society for Testing and Materials (ASTM):
 - A167-99 (2004).....Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - A185-02.....Steel, Welded Wire Fabric, Plain for Concrete
 - A615/A615M-04b.....Deformed and Plain Billet-Steel Bars for Concrete
 - C33-03.....Concrete Aggregates
 - C150-04ae1.....Portland Cement
 - C503-03.....Marble Dimension Stone (Exterior)
 - C568-03.....Limestone Dimension Stone
 - C615-03.....Granite Dimension Stone
 - C616-03.....Quartz-Based Dimension Stone
 - C979-99.....Pigments for Integrally Colored Concrete

CAST STONE MASONRY

- C1194-03.....Compressive Strength of Architectural Cast Stone
- C1195-03.....Absorption of Architectural Cast Stone
- C3164-03.....Standard Specification for Architectural Cast Stone.
- D2244-02e1.....Test method for calculation of color differences from instrumentally measured color coordinates.

1.7 QUALITY ASSURANCE

- A. Manufacturer: Must have ten (10) 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.
- B. Manufacturer: Must be a member of the Cast Stone Institute.
- C. Manufacturer: Must have a certified plant (certification by the Cast Stone Institute).
- D. Stone setter: Must have ten (10) years experience setting cast or natural building stone.
- E. Testing: One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14 m³) 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% 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 and 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.

1.8 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 in. (3mm), whichever is greater, not to exceed + 1/4 in (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 in. (3 mm), whichever is greater.

- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features - On formed sides of unit, 1/8 in (3 mm), on unformed sides of unit, 3/8 in (9 mm) maximum deviation.

1.9 MOCK-UP

Provide full size unit(s) for use in construction of sample capstone - for approval. The mock-up becomes the standard of workmanship for the project. Coordinate mock-up with Columbarium Niche Unit bearing requirements. Mock-up shall not be a part of the final project, but shall be constructed separately at a near-by location determined by the VA resident engineer.

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% for units exposed to freeze-thaw environments. Air entrainment is not required for vibrant dry tamp (VDT) products.
 4. Freeze thaw - ASTM C 1364L The cumulative percent weight loss (CPWL) shall be less than 5% after 300 cycles of freezing and thawing.
 5. Linear Shrinkage - ASTM C 426L 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 (14m3) 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.

CAST STONE MASONRY

- 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). Rebar size, material, quantity and placement to be determined in the manufacturer's design of individual units.
 - 2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.
- H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as galvanized steel, brass, or stainless steel Type 302 or 304.

2.3 COLOR AND FINISH

- A. Provide color samples (full range) for COR selection and approval.
- B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 square inch (25mm²) and not obvious under direct daylight illumination at a 5 ft. (1.5m) distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3m) distance.
- D. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
- E. Total color difference - not greater than 6 units.
- F. Total hue difference-not greater than 2 units.

CAST STONE MASONRY

- G. 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 6-ft distance.
- H. Cut numerical markers into face of cast stone by sandblasting where indicated on the drawings. All sandblasting work to be completed prior to setting cast stone - replace damaged materials with new prior to placement on columbarium niche unit wall.
- I. The occurrence of crazing or efflorescence shall constitute a cause for rejection.
- J. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.4 REINFORCING

- A. Reinforce the units as required by the manufacturer 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 1.5in. (38 mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

2.5 CURING

Cure units in a warm curing chamber 1000 F (37.80 C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 700F (21.10C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350-degree-days (i.e. 7 days @ 500F (100C) or 5 days @ 700F (210C) 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. All work performed under this section shall be in accordance with the Specifications, Drawings, and Manufacturer's instructions and recommendations. In the event of a conflict, the stricter requirement shall prevail.
- B. Installing contractor shall check cast stone materials for fit and finish prior to installation and marker sandblasting. Do not set unacceptable units.
- C. Installing contractor and cast stone manufacturer to verify and coordinate with Columbarium Niche Unit manufacturer that cast stone capstone loads and bearing points fall within Columbarium niche unit

requirements for live loads and dead loads - verify and coordinate prior to fabrication.

3.2 SETTING TOLERANCES

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

3.3 JOINTING

- A. Joint size:
 - 1. At stone/stone joints in vertical position 1/2 in typical.
Stone/stone joints at ossuary privacy wall are 3/8 in.
- B. Joint Materials:
 - 1. As indicated on the construction drawings.
- B. Location of joints:
 - 1. As shown on shop drawings.
 - 2. At control and expansion joints unless otherwise shown.

3.4 SETTING

- A. Drench units with clean water prior to setting.
- B. Fill dowel holes and anchor slots completely with epoxy.
- C. Set units in full bed of mortar, unless otherwise detailed and/or recommended by the Columbarium Niche Unit manufacturer. Coordinate bearing point locations with the Columbarium Niche Unit Manufacturer. Verify and coordinate live load and dead load requirements of the Columbarium Niche Unit prior to fabrication of Cast Stone capstone.
- D. Rake mortar joints 3/4 in. (18 mm) in. for pointing.
- E. Remove excess mortar from unit faces immediately after setting.
- F. Tuck point unit joints to a slight concave profile - verify with owner.

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 WALL PROTECTION

- A. Maintain protective boards at exposed external corners which may be damaged by construction activities.
- B. Provide protection without damaging completed work.
- C. At end of each working day, and during working day rainy weather, cover cast stone cap work exposed to weather with waterproof coverings, securely anchored extending at least 2 feet down both sides of walls. Cover cast stone work until all cap and wall joints are properly sealed and cured to be able to protect the wall/columbaria/memorial marker wall from weather and cleaning.

CAST STONE MASONRY

3.7 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.

3.8 INSPECTION AND ACCEPTANCE

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

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