

Product Specification

This section must be carefully read and edited by the Architect to meet the requirements of the project and local building code. Delete all "Specifier" notes when editing this document.

Section 04720 Cast Stone

Specifier: This section covers cast stone masonry as manufactured by Cast Stone Commercial Services. Cast stone is a highly refined architectural precast concrete product made to simulate natural cut limestone.

Cast stone is manufactured by Cast Stone Commercial Services using the Vibrant Dry Tamp (VDT) casting method. This method uses more graded aggregate and less water than architectural precast concrete (wetcast). The benefits are the fine grained texture and a total absence of bug holes. This creates a product that resembles natural cut limestone.

VDT cast stone is usually custom fabricated for each project. Inventory units may be made to order or for immediate shipment. Use of catalog units with part drawings will substantially decrease lead time. Please call us for any questions pertaining to inventory or catalog units.

Consult Cast Stone Commercial Services for assistance in editing this section for the specific project application.

Part 1: General

1.1 SCOPE

- A. All labor, materials and equipment to provide the Cast Stone shown on architectural drawings as described in this specification.
- B. Manufacturer shall furnish and deliver Cast Stone covered by this specification.
- C. Setting contractor shall unload, store, furnish all anchors, set and clean Cast Stone.

1.2 RELATED SECTIONS

Specifier: Revise the following list of related sections as required for this project. Add other sections with work related to cast stone.

- A. Section – 01 33 00 – Submittal Procedures.
- B. Section – 04 05 13 – Masonry Mortaring.
- C. Section – 04 05 16 – Masonry Grouting.
- D. Section – 04 05 19 – Masonry Anchorage and Reinforcing.
- E. Section – 04 20 20 – Unit Masonry.
- F. Section – 07 90 00 – Joint Protection.

1.3 REFERENCES

Specifier: List standards referenced in this section. This article is only a listing of those standards most commonly used.

- A. ACI 318 – Building Code Requirements for Reinforced Concrete.
- B. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Reinforced Concrete.
- D. ASTM C 33 - Standard Specification for Concrete Aggregates.
- E. ASTM C 150 - Standard Specification for Portland Cement.
- F. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method.
- G. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- H. ASTM C 260 - Standard Specification for Air-Entrained Admixtures for Concrete.
- I. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- J. ASTM C 426 - Standard Test Method for Linear Shrinkage of Concrete Masonry Units.
- K. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.
- L. ASTM C 618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- M. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- N. ASTM C 979 - Standard Specification for Coloring Pigments for Integrally Pigmented Concrete.
- O. ASTM C 989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete.
- P. ASTM C 1116 - Standard Specification for Fiber Reinforced Concrete and Shotcrete.
- Q. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
- R. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone.
- S. ASTM C 1364-10b - Standard Specification for Architectural Cast Stone.
- T. ASTM D 2244 - Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- U. Cast Stone Institute[®] Technical Manual (Current Edition).

1.4 DEFINITIONS

- A. Cast Stone: A highly refined architectural concrete stone product manufactured to simulate the fine grained texture of natural limestone.
- B. Vibrant Dry Tamp (VDT) Casting Method: Vibratory ramming of zero-slump concrete against rigid form work until it is densely compacted and ready for immediate removal from the form.

1.5 SUBMITTAL PROCEDURES

- A. Comply with Section 01 33 00 – Submittal Procedures.
- B. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.
- C. Test results: Submit manufacturers test results of Cast Stone previously made by the manufacturer.

Specifier: Cast Stone Commercial Services can help in the design process, primarily by suggesting ways to reduce complexity and make use of existing forms and profiles. Significant savings can be achieved by specifying standard or modular length units, instead of requiring the manufacturer to detail profiles and layout piece lengths specific to the project. Consult Cast Stone Commercial Services for more information if necessary, and choose 1 of the next 3 paragraphs.

- D. Shop Drawings: Submit manufacturer's submittal drawings, including profiles, cross sections, reinforcement, color, exposed faces, arrangement of joints, suggested anchoring methods, types of anchors, annotation of components and their location in project as indicated on the Drawings.
- E. Shop tickets: Submit manufacturer's part drawings, including profiles, cross sections, modular unit lengths, color, exposed faces and annotation of components proposed for use in project according to cross sections as indicated on the Drawings.
- F. Catalog Sheets: Submit manufacturer's catalog sheets showing product numbers of units proposed for use in project.
- G. Warranty: Submit Cast Stone Institute ® Member Limited Warranty.
- H. Certification: Submit valid Cast Stone Institute ® Plant Certification.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1 Cast Stone shall be produced in a plant certified by the Cast Stone Institute®.
 - 2 Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
 - 3 Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with owner, architect and contractor references.
- B. Standards: Unless otherwise specified in this section, cast stone shall comply with ASTM C 1364-10b.

Specifier: Mock-ups are optional and will often add significant expense to the project with little benefit. Scope of any mock-up must be clearly indicated on the Drawings.

Mock-ups allow the Architect to verify: color and texture of the cast stone; fit of adjacent components; quality of construction, and quality of repair methods if needed.

Revise the following paragraph as required. Delete if mock-ups are not required.

- C. Mock-up (Optional): Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.

Specifier: Delete one (1) of the following two (2) sentences.

1. Mock-ups shall remain as part of the completed Work.
 1. Mock-ups shall not remain as part of the completed Work. At architect's direction, demolish mock-ups and remove debris.
- D. Stone setter: Must have sufficient experience setting cast or natural building stone for projects of similar scope.
- E. Warranty Period: 10 years.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Delivery:
1. Deliver cast stone pieces secured to shipping pallets and protected from damage and discoloration.
 2. Protect all corners from damage.
 3. Number each piece individually to match assembly drawings.
- B. Storage:
1. Store cast stone pieces in compliance with manufacturer's instructions.
 2. Store cast stone pieces on pallets with non-staining, waterproof covers.
 3. Ventilate under covers to prevent condensation.
 4. Prevent contact with dirt.
- C. Handling: Protect cast stone pieces during handling and installation to prevent chipping, cracking or other damage.

Part 2: Products

2.1 MANUFACTURER

- A. Cast Stone Commercial Services: 301 Pleasant Drive, Dallas, TX 75217. Phone: 214-398-0170; Fax: 214-398-1293. www.caststonecommercialservices.com. Email: info@caststonecommercialservices.com.

2.2 ARCHITECTURAL CAST STONE

Specifier: The VDT casting method allows as many as 100 pieces of cast stone to be made from a single mold in an 8-hour day, depending on the size and complexity of each stone. This method is ideally suited to fast-track construction projects due to its high production capability and low form work requirements.

The VDT process guarantees total absence of bug holes and a finish that is difficult to distinguish from natural limestone. The limitation of the process is that it requires one, flat, unexposed side to the design.

Do not specify the wet cast method for our product.

- A. Casting Method: Vibrant Dry Tamp
- B. Comply with ASTM C 1364-10b
- C. Physical properties: Provide the following
1. Compressive Strength - ASTM C 1194: 6,500 psi 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 at 28 days.
 3. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
 4. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.
- D. Job site testing – One sample from production units may be selected at random from the field for each 500 cubic feet delivered to the job site.
1. Three 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 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.

2.3 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 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 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.
 2. 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.
 3. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
- 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.
- H. Fiber reinforcement (optional): ASTM C 1116

Specifier: Fiber reinforcement should be considered for high heat or extremely wet environments, usually best recommended by the manufacturer.

- I. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3 COLOR AND FINISH

Specifier: Cast Stone Commercial Services can assist in the color selection process by either providing color samples from our existing color choices, or by custom color matching a color or material chosen by the Architect. Specify one of the following three sentences.

1. Match sample on file at Architect's Office.

Specifier: Insert Cast Stone Commercial Services color name.

1. Cast Stone Commercial Services color: _____.

Specifier: Insert name of natural stone or other material to be matched. The more descriptive you are, the better the pricing will be.

- 1 Match Color: _____.

- A. 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. and the density of such voids shall be less than 3 occurrences per any 1 in.² and not obvious under direct daylight illumination at a 5 ft distance.
- B. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft. distance.
 1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
 - a. Total color difference – not greater than 6 units.
 - b. Total hue difference – not greater than 2 units.
- 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-ft. distance.
- D. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- E. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.4 REINFORCING

- A. Reinforce the units as required by the drawings and for safe handling and structural stress.
- B. Minimum reinforcing shall be 0.25 percent of the cross section area.
- C. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- D. Panels, soffits and similar stones greater than 24 in. in one direction shall be reinforced in that direction. Units less than 24 in. in both their length and width dimension shall be non-reinforced unless otherwise specified.
- E. Welded wire fabric reinforcing shall not be used in dry cast products.

2.5 CURING

- A. Cure units in a 95 percent moist environment at a minimum 70°F (21.1°C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F (10°C) or 5 days @ 70°F (21°C)) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.6 MANUFACTURING TOLERANCES

- A. Cross section dimensions shall not deviate by more than $\pm 1/8$ in. from approved dimensions.
- B. Length of units shall not deviate by more than length/ 360 or $\pm 1/8$ in., whichever is greater, not to exceed $\pm 1/4$ in.
 - 1. 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 $\pm 1/8$ in., 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., on unformed sides of unit, $3/8$ in. maximum deviation.

2.7 PRODUCTION QUALITY CONTROL

- A. Testing
 - 1. Test compressive strength and absorption from specimens taken from every 500 cubic feet of product produced.
 - 2. Perform tests in accordance ASTM C 1194 and C 1195.
 - 3. Have tests performed by an independent testing laboratory every six months.
 - 4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.
 - 5. Retain copies of all test reports for a minimum of two years.

2.8 DELIVERY, STORAGE, AND HANDLING

- A. Mark production units with the identification marks as shown on the shop drawings.
- B. Package units and protect them from staining or damage during shipping and storage.
- C. Provide an itemized list of product to support the bill of lading.

Part 3: Execution**3.1 EXAMINATION**

- A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Unacceptable units shall not be set.

3.2 SETTING TOLERANCES

- A. Comply with Cast Stone Institute[®] Technical Manual.
- B. Set stones $1/8$ in. or less, within the plane of adjacent units.
- C. Joints, plus - $1/16$ in., minus - $1/8$ in.

3.3 JOINTING

- A. Joint size
 - 1. At stone/brick joints $3/8$ in.
 - 2. At stone/stone joints in vertical position $3/8$ in.
 - 3. Stone/stone joints exposed on top $3/8$ in.

- B. Joint materials:
 - 1. Mortar, Type N, ASTM C 270.
 - 2. Use a full bed of mortar at all bed joints.
 - 3. Flush vertical joints full with mortar.
 - 4. Leave all joints with exposed tops or under relieving angles open for sealant.
 - 5. Leave head joints in copings and projecting components open for sealant.
- C. 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 mortar or non-shrink grout.
- C. Set units in full bed of mortar, unless otherwise detailed.
- D. Rake mortar joints 3/4 in. in 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 90 00.
- 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 Cast Stone Institute ® Technical Bulletin #36.
- B. Do not field apply water repellent until repair, cleaning, inspection and acceptance is completed.

Specifier: The following article is optional. Delete it if not required. Consult with Cast Stone Commercial Services for additional information on the use of a water repellent.

3.8 WATER REPELLANT

- A. Apply silane or siloxane water repellent for weatherproofing cast stone in accordance with manufacturer's instructions.
- B. Apply water repellent after pointing, repair, cleaning, inspection and acceptance are completed.

3.9 PROTECTION

- A. Protect cast stone from splashing and other damage.