

SECTION 04 72 00-ARCHITECTURAL CAST STONE

PART 1 GENERAL

1.1 SECTION INCLUDES

Architectural Cast Stone.

1.2 RELATED SECTIONS

- A. Section 04 05 13.23 - Surface Bonding Masonry Mortaring.
- B. Section 04 05 16.26 - Engineered Masonry Grouting- Masonry Grouting.
- C. Section 04 05 19.29 - Stone Anchors.
- D. Section 04 20 00 - Unit Masonry.
- E. Section 07 60 00 - Flashing and Sheet Metal
- F. Section 07 90 00 - Joint Protection

1.3 REFERENCES

- 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 595 - Blended Cement
- G. ASTM C 1157 - Hydraulic Cement
- H. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method.
- I. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- J. ASTM C 260 - Standard Specification for Air-Entrained Admixtures for Concrete.
- K. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- L. ASTM C 426 - Standard Test Method for Linear Shrinkage of Concrete Masonry Units.
- M. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.
- N. ASTM C 618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- O. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- P. ASTM C 979 - Standard Specification for Coloring Pigments for Integrally Pigmented Concrete.
- Q. ASTM C 989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete.
- R. ASTM C 1116 - Standard Specification for Fiber Reinforced Concrete and Shotcrete.
- S. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
- T. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone.
- U. ASTM C 1364 - Standard Specification for Architectural Cast Stone.
- V. ASTM D 2244 - Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

1.4 DEFINITIONS

- A. Cast Stone: Refined architectural concrete building unit manufactured to simulate natural cut stone, used in Division 4 masonry applications.
- B. Dry Cast: Manufactured from zero slump concrete.
- C. Vibrant Dry Tamp (VDT) Casting Method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.
- D. Machine casting method: Manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it is densely consolidated.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1.Preparation instructions and recommendations.
 - 2.Storage and handling requirements and recommendations.
 - 3.installation instructions.
 - 4.Cast Stone Institute Plant Certification.
- C. Shop Drawings: Include profiles, cross-sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, annotation of stone types and their location.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and textures selected.
- F. Test Results: Submit manufacturer's representative test results of Cast Stone made by the manufacturer. Certify products provided meet or exceed specified requirements.
- G. Closeout Submittals:
 - 1.Provide Cast Stone Institute Member Limited Warranty
 - 2.Provide manufacturer's maintenance instructions that include recommendations for cleaning and maintenance.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1.Member of the Cast Stone Institute with a minimum of 10 years documented experience with projects of similar size and scope.
 - 2.Submit a written list of similar projects at least 3 years of age, with owner, architect and contractor references for each.
 - 3.Cast Stone produced in a plant certified by the Cast Stone Institute.
 - 4.Sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone units secured to shipping pallets and protected from damage and discoloration.
- B. Store products off the ground and under cover in manufacturer's unopened packaging until ready for installation.
- C. Mark production units with the identification marks as shown on the shop drawings.

- D. Protect units from staining or damage during shipping and storage.
- E. Provide an itemized list of product to support the bill of lading.
- F. Protect cast stone units, including corners and edges, during storage, handling, and installation to prevent chipping, cracking, staining, or other damage.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

- A. Provide a 10 year Limited Product Warranty for the Cast Stone supplied.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Midwest Cast Stone , which is located at: 1610 State Ave.; Kansas City, KS 66102 ; Tel: 913-371-3300 ; Fax: 888-830-1954; Email: request info (david@midwestcaststone.com); Web: www.midwestcaststone.com
- B. Sun Precast Company. Or equal

2.2 ARCHITECTURAL CAST STONE

- A. Unit Sizes and Shapes: Provide Architectural Cast Stone in the sizes and shapes indicated on the Drawing. Architectural cast stone shall comply with the requirements of ASTM C 1364 and be provided with the following physical properties:
 - 1.Compressive Strength ASTM C 1194: 6,500 psi minimum at 28 days.
 - 2.Absorption ASTM C 1195: 6 percent maximum by the cold water method, or 10 percent maximum by the boiling method at 28 days.
 - 3.Air Content ASTM C 173 or C 231: For wet cast product 4 to 8 percent for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.
 - 4.Freeze-thaw ASTM C 1364: CPWL shall be less than 5 percent after 300 freeze/ thaw cycles.
 - 5.Linear Shrinkage ASTM C 426: Not exceed 0.065 percent.
- B. Cast Stone Materials: Materials shall match those required to product results matching the physical properties specified, the colors and finishes of the Architects file sample and the following:
 - 1.Portland cement: Type I or Type III, white and/or grey, ASTM C 150.
 - 2.Coarse aggregates: Granite, quartz or limestone, ASTM C 33, except for gradation.
 - 3.Fine aggregates: Manufactured or natural sands, ASTM C 33, except for gradation.
 - 4.Colors: Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
 - 5.Admixtures: Comply with the following:
 - a.ASTM C 260 for air-entraining admixtures.
 - b.ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.
 - c. 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.

- d. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
- e. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features

6. Water: Potable.

7. Reinforcing Bars: ASTM A 615/A 615M: Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 inches.

8. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

9. Fiber reinforcement (optional): ASTM C 1116

10. 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

C. Related Products:

Use Type 304 stainless steel anchors for highly corrosive environments, such as coastal areas, and for 100-year type construction. Shelf angles and other similar structural items should be galvanized. Midwest Cast Stone does not supply anchoring hardware, but will assist in specifying anchors for a specific applications.

1. Anchors: As scheduled or indicated on Drawings.

2. Anchors: Brass, non-corrosive, sized for conditions.

3. Anchors: Hot-dip galvanized steel, sized for conditions.

4. Anchors: Type 304 stainless steel, sized for conditions.

5. Cleaners: Prosoco Enviro Klean Safety Klean.

6. Cleaners: Prosoco Sure Klean 600 Detergent.

7. Mortar: Type N, ASTM C 270 as specified in Section 04 05 13.23 - Surface Bonding Masonry Mortaring Masonry Mortar.

8. Joint Sealant: As specified in Section 07 91 26 - Joint Fillers.

9. Water Repellant: Prosoco Sure Klean Weather Seal Siloxane WB.

10. Water Repellant: Prosoco Sure Klean Weather Seal Siloxane PD

2.3 FABRICATION

A. Cast Stone Shapes: Unless otherwise indicated on Drawings, provide:

1. Suitable wash on exterior sills, copings, projecting courses, and units with exposed top surfaces.

2. Drips on projecting units, wherever possible.

B. Color and Finish:

1. Match sample(s) on file at the Architect's location.

2. 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 inch and the density of such voids shall be less than 3 occurrences per any 1 square inch area and not obvious under direct daylight illumination at a 5 foot distance.

3. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 foot distance.

4. 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.

- 5.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.
- 6.The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- 7.Remove cement film, if required, from exposed surfaces prior to packaging for shipment

C.Reinforcing:

- 1.Reinforce the units as required by the Drawings and as recommended by the manufacturer for safe handling and structural stress.
- 2.Minimum reinforcing shall be 0.25 percent of the cross section area.
- 3.Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 inches of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- 4.Panels, soffits and similar stones greater than 24 inches (600 mm) in one direction shall be reinforced in that direction. Units less than 24 inches (600 mm) in both their length and width dimension shall be non-reinforced unless otherwise specified.
- 5.Welded wire fabric reinforcing shall not be used in dry cast products.

D.Curing:

- 1.Cure in a warm curing chamber approximately 100 degrees F (37.8 degrees C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70 degrees

F (21.1 degrees C) for 16 hours after casting.

- 2.Additional yard curing at 95 percent relative humidity shall be 350 degree days (i.e. 7 days @ 50 degrees F (10 degrees C) or 5 days @ 70 degrees F (21 degrees C)) prior to shipping.
- 3.Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

E.Production Tolerances:

- 1.Cross section dimensions shall not deviate by more than +/- 1/8 inch from approved dimensions.
- 2.Length of units shall not deviate by more than length/ 360 or +/- 1/8 inch, whichever is greater, not to exceed +/- 1/8 inch.
- 3.Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the Architect.
- 4.Warp, bow or twist of units shall not exceed length / 360 or +/- 1/8 inch, whichever is greater.
- 5.Location of dowel holes, anchor slots, flashing grooves, false joints and similar features; on formed sides of unit, 1/8 inch, on unformed sides of unit, 3/8 inch maximum deviation.

2.4 SOURCE QUALITY CONTROL

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

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions, ACI 530.1 and approved submittals.
 - 1. Check Cast Stone materials for fit and finish prior to installation. Unacceptable units shall not be set.
 - 2. Set units in full bed of mortar, unless otherwise indicated on the Drawings. It is not necessary to rake joints for later tuckpointing; standard full mortar application with tooling.
 - 3. Vertical Joints: Fill vertical joints with mortar.
 - 4. Head Joints: Leave head joints in copings and similar components open for sealant.
 - 5. Joints:
 - a. Width: 3/8 inch wide; unless otherwise indicated on the Drawings or elsewhere in the specifications.
 - b. Mortar joints should have a slight concave profile; unless otherwise indicated on the Drawings or elsewhere in the specifications.
 - 6. Remove excess mortar immediately; remove mortar fins and smears before tooling joints.
 - 7. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
 - 8. Cover wainscot for protection and bond separation with plastic, felt paper or other approved products.
 - 9. Cover freshly installed masonry products as required to assist with the curing process.
- B. Control Joints: Provide as indicated on the Drawings and In accordance with the following:
 - 1. NCMA TEK Bulletin 5-2A: Clay and Concrete Masonry Banding Details.
 - 2. NCMA TEK Bulletin 10-1A: Design of Concrete Masonry for Crack Control.
 - 3. NCMA TEK Bulletin 10-2C: Control Joints for Concrete Masonry Walls - Empirical Method.
- C. Inspection:
 - 1. Inspect finished installation according to Cast Stone Institute Technical Bulletin #36.
 - 2. Do not field apply sealer water repellent until repair, cleaning, inspection is completed.
- D. Sealant Joints:
 - 1. As specified in Section 07 91 26 - Joint Fillers.
 - 2. Prime ends of units, insert properly sized backing rod, and install sealant.
 - 3. Provide sealant joints at following locations:
 - a. Copings and cast stone units with exposed tops.
 - b. Joints at relieving angles.
 - c. Control and expansion joints.
 - d. As indicated on the drawings.

3.4 TOLERANCES

A. Comply with Cast Stone Institute Technical Manual and the following.

- 1.Variation from Plumb: Do not exceed 1/8 inch in 5 feet or 1/4 inch in 20 feet or more.
- 2.Variation from Level: Do not exceed 1/8 inch in 5 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.
- 3.Variation in Joint Width: Do not vary joint thickness more than 1/8 inch or 1/4 of nominal joint width, whichever is greater.
- 4.Variation in Plane Between Adjacent Surfaces: Do not exceed 1/8 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.5 REPAIR AND CLEANING

- A. Repair chips with touchup materials furnished by manufacturer.
- B. Clean exposed units after mortar is thoroughly set and cured.
- C. Areas with heavy soiling use a wood block or non-metallic scraper.
- D. Apply approved cleaner to units in accordance with manufacturer's instructions.

3.6 WATER REPELLENT

- A. Apply water repellant for weatherproofing in accordance with water repellant manufacturer's instructions, after installation, cleaning, repair, inspection, and acceptance of units are completed

3.7 PROTECTION

- A . Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION