1. GENERAL:

1.1. DEFINITIONS

A. **Dry Cast Concrete Products** are manufactured from zero-slump concrete.
   1. The **Vibrant Dry Tamp (VDT)** casting method: manufactured from earth-moist, zero-slump concrete using vibratory ramming against a rigid mold until it is densely compacted.
   2. **The Machine Casting Method**, manufactured from earth-moist, zero-slump concrete compacted by machinery using vibration and pressure against a rigid mold until it is densely compacted.

B. **Wet Cast Concrete Products** are manufactured from measurable-slump concrete.

C. **Cast Stone** is a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.

1.2. DESCRIPTION OF WORK

A. The work of this section shall include all labor, materials, and equipment to provide and install the Cast Stone shown on architectural drawings.
   1. Manufacturer shall furnish Cast Stone covered by this specification.
   2. Installing contractor shall furnish all required anchors and shall unload, store, set, anchor, patch, clean, and optionally seal the Cast Stone as required.

1.3. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to the work of this section.

B. **Section 01 33 00:** Submittal Procedures

C. **Section 04 05 13:** Masonry Mortaring

D. **Section 04 05 16:** Masonry Grouting

E. **Section 04 05 19:** Masonry Anchorage and Reinforcing

F. **Section 07 90 00:** Joint Protection

1.4. 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 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/C494 M:** Standard Specification for Chemical Admixtures for Concrete

L. **ASTM C 666:** Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

M. **ASTM C 979:** Standard Specification for Coloring Pigments for Integrally Pigmented Concrete

N. **ASTM C 1194:** Standard Test Method for Compressive Strength of Architectural Cast Stone

O. **ASTM C 1195:** Standard Test Method for Absorption of Architectural Cast Stone

P. **ASTM C 1364:** Standard Specification for Architectural Cast Stone

Q. **ASTM D 2244:** Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates
R. **Cast Stone Institute® Technical Manual** (Current Edition)

1.5. SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures
B. **Product Data:** Submit manufacturer's product data for each type of Cast Stone unit.
C. **Shop Drawings:** Submit manufacturer's shop drawings including profiles, cross-sections, reinforcement, exposed faces, arrangement of joints, anchoring methods and anchors (if required), annotation of stone types, and their locations on the building.
D. **Engineering:** The contractor shall design all cast stone units to support the required building code live, dead, seismic, and wind loads shown on the contract documents. In addition, all cast stone units shall be designed to resist the stresses caused by erection. Final member size and configuration shall be the responsibility of the cast stone manufacturer and must meet with the approval of the A/E. Provide manufacturer's complete design calculations prepared and sealed by a structural engineer registered in the state of the project.
E. **Samples:** Submit representative samples of the Cast Stone (at least 30 in^2 in size) for all colors, textures, and mix designs proposed for use in the project.

1.6. QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Manufacturer shall have sufficient plant facilities to produce the Cast Stone shown in the architectural drawings in accordance with the project schedule.
   2. Manufacturer shall have at least ten (10) years continuous operational experience in the fabrication of Cast Stone in types and quantities similar to the project.
   3. Manufacturer is a producing member of the Architectural Precast Association.
B. Installer Qualifications:
   1. Installer shall have sufficient resources to install the Cast Stone shown in the architectural drawings in accordance with the project schedule.
   2. Installer shall have not less than three (3) years continuous operational experience in successful installation of Cast Stone in types and quantities similar to the project.
C. Manufacturer and Installer shall comply with the requirements of the Cast Stone Institute® Technical Manual and with the project specifications.

2. PRODUCTS:

2.1. ARCHITECTURAL CAST STONE

A. Obtain all Cast Stone materials from a single source.
B. **Manufacturer:**
   Nelson Precast Products, 2501 W Lexington St, Baltimore, MD 21223, (410) 522-7190
C. All Cast Stone units shall comply with ASTM C 1364.
D. **Physical properties:**
   1. Compressive strength shall meet or exceed 6,500 psi at 28 days when tested according to ASTM C 1194.
   2. Absorption shall not exceed 6% when tested according to the cold water method described in ASTM C 1195.
   3. Air content shall be between 4-8% for units produced by the Wet Cast method. Air entrainment is not required for units produced by the Dry Cast method.
E. Manufacturer shall test units for conformance to compressive strength requirements at least once for

every 500 cubic feet of material produced.

F. Job site testing may be performed 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). Coarse aggregates shall be optional for units made using the Dry Cast 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:**
   1. ASTM C 260 for air-entraining admixtures (not for use in Dry Cast Concrete Products)
   2. ASTM C 494/C 495M Types A – G for water reducing, retarding, accelerating, and high range admixtures.
   3. Other admixtures for which no ASTM standard exists, including integral water repellants and other chemicals, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.

F. **Water:** Clean and potable municipal water.

G. **Reinforcing:**
   1. ASTM A 615/A 615M for reinforcing bars using grade 40 or 60 steel.
   2. ASTM A 185 for welded wire fabric (not for use in Dry Cast Concrete Products)

H. All anchors, dowels, and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive finish.

2.3. MANUFACTURING TOLERANCES

A. **Color and Finish:**
   1. Cast Stone shall be appraised for color and finish quality under direct daylight illumination to avoid crosslighting conditions.
   2. All surfaces exposed to view shall have a fine-grained texture similar to natural stone. Air voids shall not be obvious when viewed under direct daylight illumination at a 5 ft distance.
   3. All units provided shall display a color and texture generally equal to the approved sample when viewed under direct daylight illumination at a 10 ft distance.
   4. The range of total acceptable color (lightness, color saturation, and hue) variation shall not exceed a ΔE of 6.0 (CIELAB 1976) when measured per ASTM D 2244, provided that hue does not exceed a ΔE of 2.0.
   5. Minor chipping resulting from shipping and delivery shall not be grounds for rejection, provided that chipping is not obvious when viewed under direct daylight illumination from a 20 ft distance. The occurrence of crazing or efflorescence shall not be grounds for rejection.

B. **Unit Size:**
   1. All pieces shall be made exactly in accordance with approved shop drawings.
   2. Cross sectional dimensions shall not deviate by more than ±1/8" from approved drawings.
   3. Length shall not deviate by more than length/360 or ±1/8", whichever is greater.

2.4. REINFORCING

A. Reinforcing to be provided where necessary to facilitate safe handling and setting or to withstand structural stresses.

B. Cast Stone panels, soffits, and similar stones greater than 24 inches in one direction shall be reinforced in that direction.

C. Cast Stone units less than 24 inches in both their length and width shall be non-reinforced unless otherwise specified.

2.5. CURING

A. Cast Stone units shall be cured in a warm curing chamber (approximately 90ºF at 95% relative humidity) for approximately 16 hours after casting.
B. Cast Stone units shall additionally be yard-cured for a total of 350 degree-days (i.e. 7 days at 50ºF or 5 days at 70ºF) in 95% relative humidity prior to shipping.
C. Form-cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.6. DELIVERY, STORAGE, AND HANDLING

A. All Cast Stone units shall be labeled on a non-exposed face with the identification mark shown in the manufacturer's shop drawings.
B. Units shall be packaged in a way that offers reasonable protection against staining or damage during shipping and storage.
C. All pallets shall be labeled with a complete list of the pallet contents.
D. An itemized list of products shall be provided for each shipment of Cast Stone units.

3. EXECUTION:

3.1. EXAMINATION

A. Installer shall inspect all Cast Stone units prior to accepting delivery.
B. Installer shall check all Cast Stone units for fit and finish prior to installation.
C. Do not set unacceptable units.

3.2. SETTING TOLERANCES

A. Stones must be set within ±1/8" of the plane of adjacent units.
B. Joints shall be between 1/16" over and 1/8" under the specified size.

3.3. JOINTING

A. Stone/stone joints and stone/brick joints shall be 3/8" unless specified otherwise.
B. Joint material: 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 or under relieving angles open for sealant.
F. Leave head joints in copings and projecting components open for sealant.

3.4. SETTING

A. Set units exactly in locations shown in shop drawings.
B. Drench units with clean water prior to setting.
C. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
D. Set units in full bed of mortar unless otherwise noted.
E. Rake mortar joints 3/4" for pointing.
F. Remove excess mortar from unit faces immediately after setting.
G. Tuck point unit joints to a slight concave profile.

3.5. REPAIR AND CLEANING

A. Protect Cast Stone from staining and chipping before, during, and after installation.
B. Repair minor chips with patching material furnished by manufacturer, following manufacturer's instructions for use.
C. Do not use any cleaner not designed for use on concrete without express approval of manufacturer.
D. Do not clean Cast Stone by power washing or sandblasting without express approval of manufacturer.

3.6. INSPECTION AND ACCEPTANCE

A. Inspect finished work according to Cast Stone Institute® Technical Bulletin #36.
B. Inspect under direct daylight conditions.
C. Inspect Cast Stone only when dry.

3.7. WATER REPELLANTS

A. Do not apply water repellant until repair, cleaning, inspection, and acceptance is completed.
B. If a water repellant is required, apply a silane or siloxane repellant after inspection is complete.
C. Do not apply water repellant within 48 hours of rain or building washdown.
D. Do not apply water repellant when air temperature is below 50°F, or when air temperature has been below 40°F within 24 hours.