

SECTION 04100  
MORTAR

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Mortar and grout for unit masonry.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, normal-Type I.
- B. Masonry Cement; ASTM C98, for general use.
- C. Mortar Aggregate: ASTM C144, standard masonry type; clean, dry, protected against dampness, freezing, and foreign matter.
- D. Grout Course Aggregate: Specifications for aggregates for masonry grout ASTM C404.
- E. Grout Fine Aggregate: Specification for masonry mortar ASTM C144, except that all sand for mortar in 1/4" joints shall pass a no. 16 sieve.
- F. Hydrated Lime: ASTM C207, Type S.
- G. Water: Clean and potable.

2.02 MIXES

- A. Mixes: ASTM C270, Type as specified below, using the Property Method.
  - 1. Mortar for masonry in contact with earth and exterior masonry: Type S.
  - 2. Mortar for non-load bearing interior walls and partitions: Type N.
  - 3. Mortar for reinforced masonry: Type S.
  - 4. Interior pointing mortar: Type N.
  - 5. Exterior pointing mortar: Type S.

2.03 MORTAR MIXING

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar or grout.
- C. If water is lost by evaporation, retemper within one hour of mixing. Do not retemper mortar after one hour of mixing.
- D. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

2.04 GROUT MIXES

- A. Mixes for bond beams, lintels and engineered masonry: 3000 psi strength at 28 days, 7-8 inch slump, mixed in accordance with ASTM C467 coarse grout.
- B. Mixing: Thoroughly mix ingredients in quantities needed for immediate use in accordance with ASTM C476 coarse grout. Do not use anti-freeze compounds to lower the freezing point of mortar.

## 2.05 MORTAR COLOR

- A. Mortar Color: Add pigments as directed by Architect, but not to exceed 15 percent of the weight of the cement, except that carbon black shall not exceed three percent of the weight of the cement.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install mortar and grout in accordance with 04300.
- B. Work grout into cores and cavities to eliminate voids.
- C. Do not displace reinforcing steel when placing grout.
- D. Clean concrete grout spaces of excess mortar and debris.
- E. Grout hollow metal frames for doors and other openings.
- F. Brace masonry for wet grout pressure.

END OF SECTION

**SECTION 04221  
CONCRETE MASONRY BUILDING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

Work covered by this section includes all labor, tools, equipment and materials required to install reinforced single wythe concrete masonry building walls as shown on the drawings and specified herein.

**1.02 RELATED WORK**

- A. 03300 – Cast-in-Place Concrete
- B. 09910 – Painting and Coating

**1.03 REFERENCES**

- A. ASTM A-82..... Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
- B. ASTM A-116..... Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
- C. ASTM A-496..... Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
- D. ASTM A-615..... Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- E. AWWA A-641 ..... Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
- F. ASTM A-653..... Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
- G. ASTM A-767 ..... Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
- H. ASTM C-90 ..... Standard Specification for Load bearing Concrete Masonry
- I. ASTM C-270 ..... Standard Specification for Mortar for Unit Masonry
- J. ASTM C-476 ..... Standard Specification for Grout for Masonry

**1.04 QUALITY ASSURANCE**

Concrete Masonry Units (CMU) shall be manufactured and supplied by a single – source manufacturer, who has produced products for not less than 10 years. Units shall be free from defects. Any defective products shall not be used in work and shall be removed from project site.

**1.05 SUBMITTALS**

- A. **General:** Contractor to provide 6 copies of the following required submittals to Engineer for approval.
- B. **Product Data:** Provide manufacturer's standard product data sheets, storing instructions, installation instruction, and drawings. As a minimum, submittals shall be provided for:
  - a. Concrete masonry unit standard drawings showing shapes, types and dimensions of units to be used.
  - b. Concrete mix design for CMU
  - c. Mortar mix design
  - d. Grout mix design

- e. Joint reinforcement
- f. Metal flashing

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Contractor shall be responsible for the delivery, storage and handling of products in accordance with the manufacturer's recommendations.
- B. Mortar and grout shall be stored in manufacturer's original packaging, and kept clean, dry, and protected against dampness.

### **PART 2 - PRODUCTS**

#### **2.01 CONCRETE MASONRY UNITS (CMU)**

- A. Concrete masonry units shall be hollow load bearing block units conforming to ASTM Specification C90 (latest revision). Units shall be Type 1 – moisture controlled.
- B. Solid concrete masonry sill units shall be used at all door openings. Units shall be provided with manufactured slope toward exterior face of unit for positive drainage away from unit. Unit shall also have manufactured chamfered edge at exterior face of unit. Units shall conform to ASTM C90, Type 1- Moisture controlled.
- C. Manufactured corner, control joint, and bond beam units shall be used on this project. Modifying standard block units for use at corners, control joints, lintels or bond beams will not be acceptable on this project.

#### **2.02 STEEL REINFORCEMENT**

- A. CMU horizontal reinforcement shall be manufactured, deformed, "ladder" type, zinc-coated, cold-drawn steel conforming to ASTM A82, A116, A496 and A641. Reinforcing shall consist of two deformed longitudinal wires number 9 gage or larger, weld connected with number 12 gage or larger cross wires. Out-to-out spacing of longitudinal wires should be 1 5/8" less than the width of the masonry units. The distance between welded contacts of cross wires with each longitudinal wire shall not exceed 16 inches. Zinc coating shall be applied to a weight of not less than 0.4oz. per square foot of uncoated wire surface. Joint reinforcement shall be furnished in flat sections 10 to 20 feet in length. Manufactured shaped sections shall be used at all corners and wall intersections. Lap reinforcing a minimum of 6".
- B. Reinforcing steel bars shall be 60 ksi minimum yield strength conforming to ASTM A615 and A767. Deformed bars shall be used except where shown otherwise on drawings. Sizes shall be as shown on drawings.

#### **2.03 MORTAR AND GROUT**

- A. Mortar for masonry construction shall conform to ASTM C270. Mortar shall be type S having a minimum compressive strength of 1800psi. at 28 days. Color shall be as selected by Engineer. Anti-freeze admixtures will not be allowed on this project.
- B. Grout for bond beams, lintels, filling vertical cells, and other masonry construction shall conform with ASTM C476. Grout shall be coarse type having a minimum compressive strength of 2500psi at 28 days. Anti-freeze admixtures will not be allowed on this project.

#### **2.04 FLASHING**

Flashing shall be 24 gage steel conforming to ASTM A653. Flashing shall be provided with formed drip edge as shown on drawings.

#### **2.05 CONTROL JOINTS**

Control joints shall be constructed with manufactured rubber or neoprene preformed control joint strips. Control joints shall be shaped to match concrete masonry control joint units.

#### **2.06 LUMBER**

All lumber shall be surfaced four (4) sides and the dressed sizes shall conform to the Department of Commerce's Simplified Practice Recommendations F-16-39.

1. The lumber grades for the various portions of the work shall be as follows:
  - a. No. 2 Treated Yellow Pine sills or heel plates - all lumber in contact with concrete.
  - b. No. 2 Dense Southern Yellow Pine, or equivalent grade of fir, studs, plates, ceiling joists, rafters, external trim.
  - c. No. 3 Dense Southern Yellow Pine, or equivalent grade of fir, furring, blocking, bracing, nailers, purlins.

All lumber in contact with concrete and as shown on the drawings as "treated" shall be pressure treated with water repellent and paintable material. The maximum allowable moisture content of the wood prior to treatment shall be not over 25% oven dry basis. Treatment is to be by pressure processes. The minimum net retention of the preservative is to be not less than 6 pounds per cubic foot.

## **2.07 HARDWARE**

All hardware shall be stainless steel with satin finish. The single door settings shall each have 3 stainless steel hinges with 5 knuckles. The locksets shall be keyed the the Owners master lock. The handles shall be ADA compliant lever handles. The exterior doors shall include automatic closers with hold-open. The thresholds shall be aluminum with an ADA compliant 1/2" maximum height.

## **2.08 FASTENERS AND CONNECTORS**

All nails, bolts, etc., shall be adequate in size for the purpose for which they are used. Nails used to attach corrugated metal siding or roofing shall be aluminum or galvanized screw-thread nails with neoprene water-tight washers, 2 inches in length. All metal connectors shall be as specified on the plans.

## **2.09 CAULKING**

All caulking compound shall be paintable silicon, light in color, elastic and waterproof.

## **2.10 DOORS**

All doors shall be as specified on the plans.

## **2.11 AUXILLARY EQUIPMENT**

All auxiliary equipment such as wall heaters, exhaust fans, sinks, etc., shall be as specified on the plans.

## **2.12 CONCRETE**

All concrete shall be installed and finished in accordance with Section 03 30 00 of these specifications.

## **2.13 ELECTRICAL WORK**

Electrical work shall be in accordance with Section 26 05 10 of these specifications

## **2.14 PAINT**

All interior and exterior surfaces exposed in the finished work excluding floors and slabs shall be painted. Painting shall be in accordance with specification Section 09 91 00. The colors shall be as selected by the Owner.

## **PART 3 - INSTALLATION**

### **3.01 General**

- A.** Construction of concrete masonry shall be in strict accordance with the Concrete Masonry Handbook as published by the Portland Cement Association (latest revision).
- B.** Cutting of individual masonry units prior to installation shall be with power masonry saw. Masonry shall be laid plumb, true to line, with level courses accurately spaced. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Vertical joints shall be shoved tight. Each unit shall be adjusted to final position while mortar is still soft and plastic. Any unit that is disturbed after mortar has stiffened shall be removed and re-laid with fresh mortar. Courses shall be so spaced that backing masonry will level off, flush with the face work at all joints where ties occur. Chases and raked-out joints shall be kept free from mortar or other debris.

### **3.02 COURSING**

Concrete masonry units shall be laid in running bond for this project. Masonry mortar joints shall be laid with uniform thickness of 3/8". Mortar joints shall have raked finish on exterior and interior of walls.

### **3.03 PLACING AND BONDING**

- A.** Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B.** Lay hollow masonry units with face shell bedding on head and bed joints.
- C.** Remove excess mortar as work progresses.
- D.** Interlock intersections and external corners.
- E.** Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F.** Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- G.** Cut mortar joints flush where wall base is scheduled.

### **3.04 WEEPS**

Install weeps above through wall flashing at a maximum 48" on center horizontally in first course above bottom of wall.

### **3.05 HORIZONTAL JOINT REINFORCEMENT**

Horizontal joint reinforcement shall be installed at 16" on center vertically. Lap reinforcement at ends a minimum distance of 12". Joint reinforcement shall be interrupted/discontinued at control joints.

### **3.06 FLASHING**

Flashing shall be installed at locations shown on drawings. Flashing shall be lapped at ends a minimum distance of 6". Turn flashing, fold, and seal at corners, bends and interruptions. Provide drip edge where shown on drawings.

### **3.07 BOND BEAMS AND LINTELS**

- A.** Bond beams and lintels shall be installed over all masonry opens and at locations shown on drawings. Grout fill shall be placed and consolidated without displacing steel reinforcement. Masonry bond beams and lintels shall attain their specified strength before temporary supports are removed.
- B.** Reinforcing at control joints shall be discontinued as detailed on drawings. Where splices are required for continuity, reinforcement shall be lapped 24 bar diameters or 12 inches, whichever is greater.

### **3.08 MORTAR**

Materials shall be accurately measured proportions and mixed with as much water as may be necessary to produce the wettest workable consistency possible. Mortar shall be placed in final position within 2 hours after mixing. Mortar not used or that has started to set within this time interval shall be discarded. Mortar that has stiffened within the above time interval, because of evaporation of moisture from the mortar, shall be re-tempered to restore its workability.

### **3.09 HOT WEATHER INSTALLATION**

Masonry erected when the ambient air has a temperature of more than 99 degrees F., in the shade, and has a relative humidity of less than 50 percent shall be protected from direct exposure to wind and sun for 48 hours after installation.

### **3.10 COLD WEATHER INSTALLATION**

No frozen work shall be built upon. Before erecting masonry during temperatures below 40 degrees F., a written statement shall be submitted and approval received of the methods proposed to heat the masonry materials and protect the masonry from freezing as required below. Masonry units shall be kept completely covered and free from frost, ice, and snow at all times and shall have a minimum temperature of 30 degrees F. when laid. Temperature of mortar, and, if used, grout shall be between 70 degrees F. and 110 degrees F. Temperature of mixing water or of water and sand introduced to cement shall not exceed 160 degrees F. The air temperature on both sides of the masonry shall be maintained above 40 degrees F. for at least 72 hours but may be reduced to 48 hours if high-early-strength cement is used instead of Portland cement or masonry cement in the mortar. No masonry shall be laid at temperatures below minus 10 degrees F. unless authorized in writing.

### **3.11 ACCOMMODATION OF ACCESSORIES AND FIXTURES**

- A.** Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics. Wherever possible, full units of the proper size shall be used in lieu of cut units. Cut edges shall be clean, true, and sharp. Openings shall be carefully cut, formed, or otherwise neatly made for recessed items and for electrical, plumbing, or other mechanical installations so that wall plates, cover plates, or escutcheons required by the installation will completely conceal the openings and will have bottoms in alignment with lower edge of masonry joints. Webs of hollow masonry units shall be cut the minimum required for the installation. Reinforced-masonry or structural steel lintels shall be provided as indicated above openings over 12 inches wide for pipe, ducts, and cable trays, unless steel sleeves are used.
- B.** Openings around flush mounted electrical outlet boxes in wet locations shall be pointed flush with mortar including flush joint above the box. Anchors, ties, wall plugs, accessories, flashings, pipe sleeves, and other items required to be built in shall be built in as the masonry work progresses. Anchors, ties, and joint reinforcement shall be fully embedded in mortar. Cells receiving anchor bolts and cells of first masonry course below bearing plates shall be filled solidly with mortar or grout.

### **3.12 PROTECTION**

Surfaces of masonry not being worked on shall be properly protected at all times. When rain or snow is imminent, the tops of exposed masonry (and structural woodwork over which brickwork is placed) shall be covered with a strong non-staining waterproof membrane well secured in place and in a manner that will prevent moisture from accumulating within the unfinished wall. Adequate provisions shall be made during construction to prevent damage by wind.

### **3.13 SOLID FILLED VERTICAL CELLS**

Vertical cells adjacent to door frames shall be reinforced and filled solid with grout.

Vertical cells shall also be reinforced and grout filled at a maximum horizontal spacing of 48" on center. Reinforcing shall be continuous from building foundation to top of wall bond beam and/or lintels.

Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear, continuous vertical cell measuring not less than 2 by 3 inches. Vertical reinforcement shall be continuous and rigidly secured at top and bottom and at intervals necessary to hold the reinforcing in proper position.

**3.14 WORK STOP AT END OF DAY**

Unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. Before laying new work, loose mortar shall be removed and the exposed joint shall be thoroughly cleaned.

**3.15 POINTING AND CLEANING**

Mortar daubs or splashings, before setting or hardening, shall be completely removed from masonry-unit surfaces that will be exposed or painted. Before completion of the work, all defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

**3.16 EQUIPMENT INSTALLATION**

All equipment, controls, doors, hardware, etc., shall be installed in strict accordance with the manufacturer's instructions and shop drawings.

**3.17 FRAMING**

The drawings and details indicate the framing of the building, and the work must be done in accordance with the drawings and the specifications and the directions of the Engineer.

Framing lumber and other rough work shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place.

**3.18 BRIDGING**

Joists shall be bridged as required. Provide a minimum of one row of cross bridging for spans over 8 feet, but less than 16 feet and two rows for spans 16 feet and over. Wood bridging shall be not less than 1 x 3 inch nominal size for 2 inch thick and larger sized joists and shall have ends accurately level-cut to afford firm contact with the sides of the joists. Wood bridging shall be nailed at each end with 2 eight-penny nails.

**3.19 CAULKING**

Caulking shall be installed in all joints around wood or metal frames built into exterior walls and around or in any other joints so indicated on the drawings. Where jamb and head joints occur between exterior door frames, louver or grill frames, adjoining abutting materials, completely fill perimeter with caulking compound.

**PART 4 - MEASUREMENT AND PAYMENT**

**4.01 MEASUREMENT AND PAYMENT**

- A. Measurement:** No measurement will be made for work described in this section as a separate item, but shall be included in other items as specified.
- B. Payment:** Work described in this section will be paid for in the various bid items as specified.

**END OF SECTION 04221**

SECTION 04300  
MASONRY & ARCHITECTURAL CAST STONE SILLS, BANDS, & TRIM

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Concrete and Brick units.
- B. Reinforcement, anchorages, and accessories.
- C. Concrete Masonry Units (CMU)
- D. Architectural Cast Stone. Also see Section 04720 - Architectural Cast Stone

1.02 ENVIRONMENTAL REQUIREMENTS

- A. Hot Weather Requirements: In accordance w/ ACI 530.1 when ambient temp. is greater than 100 deg F or ambient temp is greater than 90 F w/ wind greater than 8mph.
- B. Cold Weather Requirements: In accord w/ ACI 530.1 when ambient temperature or temperature of masonry is less than 40F.

1.03 MOCKUP

- A. Provide mockup under provision of Section 01400.
- B. Construct mockup area as indicated on Exterior Elevations, including but not limited to mortar, and exterior wall components, exterior sheathing, damproofing, thru wall flashing, metall stud framing, gypsum board, sealants, accessories..
- C. Obtain approval prior to proceeding with the work.
- D. Remove the panel when directed by the Architect.

1.04 CERTIFICATES

- A. Submit manufacturer's certificates under provisions of Section 01400.
- B. Submit manufacturer's certificate that face brick and concrete masonry materials meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 530 and ACI 530.1

PART 2 - PRODUCTS

## 2.01 CONCRETE MASONRY UNITS

- A. Non-Load Bearing Units: ASTM C129, Type I; hollow; light weight.
- B. Load Bearing Units: ASTM C90, Type I, Hollow; light weight.
- C. Masonry Units: Modular sized to 8 x 4 x 16, 8 x 6 x 16, 8 x 8 x 16, 8 x 12 x 16 inch; provide special units for 90 degree corners, pilasters, sills, bond beams, slotted units and lintels as required and as indicated on drawings.
  - 1. Aggregate: Aggregate shall be light weight expanded clay conforming to ASTM C331. Units shall have oven dry weight of less than 105 lbs. per cubic foot.
  - 2. Shrinkage: Drying shrinkage shall not exceed 0.035 percent for the light weight units as determined by ASTM C426.
  - 3. Water Content: At the time of delivery to the job site, concrete masonry units shall have a moisture content in conformance with Table 1 of ASTM C90 for linear shrinkage from 0.03 to 0.045 percent.

Ship all units from the factory and store at the job site with all necessary protection to prevent increase of water content from rain and other sources.

- D. Special Shapes:
  - 1. Use special shapes as indicated on drawings, as specified herein, or as required for complete job.
  - 2. Provide eight inch Knockout Beam type where pilasters intersect Bond Beams.

## 2.02 BRICK UNITS

- A. Face Brick shall be Modular Size 3 1/2" to 3 5/8" wide, 2 1/4" high and 7 1/2" to 7 5/8" long.
- B. Face Brick shall be "**Old St. Louis**" reclaimed machine made **Red Brick** or approved equal.

ASTM C216 Grade SW, Type FBS and as follows:

Average Compressive Strength of 3000 psi

Rate of Absorption per ASTM C67 of less than 20g/30 sq.in.and is rated "not-effloresced"

## 2.03 CAST STONE CONCRETE SILLS, BANDS, TRIM-

- A. Refer to drawings for shapes and locations. Sizes shall be uniform with preformed inside and outside corners where required. Note special shapes required. Units shall be special shapes manufactured by one of the following or approved equal to be submitted under provisions of 01300:
  - Arrisicraft Corporation, Lombardo, IL (phone 519-653-3275, fax 519-653-1337) or Cocreham Brick and Stone, Baton Rouge, LA (distributor)
  - Continental Cast Stone Manufacturing, Inc Shawnee, Kansas (phone 913-422-7575, fax 913-422-7272) or Alajon, Inc, Trussville, AL (distributor)
- B. Band and Sill Units shall be profile shown in lengths of approximately 18". Sill units with sloped projection and drip. Provide special shapes for finished ends and corners.
  - 1. Units shall meet ASTM C1364 standard for Cast Stone with compression

strength of 6500 psi, absorption of 6% or less under ASTM C642 or ASTM C1195.

2. Finish shall be fine grained texture with no holes, air voids or other surface blemishes.
3. Color to be selected from at least 12 manufacturers standards.
4. Materials shall consist of Portland Cement (ASTM C150) white or gray for the specific color to be selected' aggregates meeting ASTM C33 and pigments meeting ASTM C979. Any reinforcement shall be galvanized or epoxy coated. Admixtures of intergral water repellants may additional be required.

- C. *Contractor shall note that special mortar meeting the requirement of the stone manufacturer may be required and that anchors used with these items shall be non-corrosive type (galvanized or stainless steel).*

## 2.04 REINFORCEMENT AND ANCHORAGES

- A. Multiple Wythe Joint Reinforcement: Continuous truss type with moisture drip; galvanized 3/16 inch side rods with 3/16 inch cross tiles.
- B. Reinforcing Steel: Type specified in Section 03300.
- C. Anchors: Face brick and CMU.
1. To structural concrete columns and beams: 12 gage anchor factory assembled to 3/16 inch diameter mill galvanized triangle ties. Provide dovetail anchor slots to receive anchor. Protect with foam filler during concrete pour. Space dove tail slots at 16" o.c.
- D. Anchors: Face brick. (Ties)
1. To structural steel (columns) 12 gage x 3/4 inch x 9 inch stud plate column anchors with 3/16 inch diameter mill galvanized triangle ties.
  2. To walls (sheathing over metal studs, etc.) 12 gage x 3/4 inch x 9 inch plate anchors with 3/16 inch diameter mill galvanized triangle ties.

## 2.05 CONTROL JOINT MATERIAL

- A. Slot Seal shall be equal to Everlastic 2015-3, HB RS Series extruded rubber conforming to ASTM D-2000 2AA-805. Equal products by Hohmann & Barnard RS series or Wire-Bond are approved for bidding.

## 2.06 MASONRY AIRSPACE & WEEP

- A. Cav Clear Masonry Mat as manufactured by Archovations, Inc. (888-436-2620) or equal shall be used prevent mortar from making contact with the back up. Masonry mat shall be fluid conducting, non-absorbent, mold and mildew resistant polymer mesh consisting of 100% recycled plastic with binder. This product will be installed in the bottom 32" of the wall.
- B. Weep Vent Material shall be CavClear Weep Vents or equal. Material is a non-woven mesh with M notched bottom in color to match mortar (color to be selected by Architect).

# PART 3 - EXECUTION

## 3.01 PREPARATION

- A. Verify items provided by other Sections of work are properly sized and located.
- B. Establish lines, levels, and coursing. Protect from disturbance.
- C. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.

### 3.02 COURSING

- A. Place masonry to lines and levels indicated.
- B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
- C. Lay concrete masonry units in running bond. Course one block unit and one mortar joint to equal 8 inches. Form concave mortar joints.
- D. Lay brick in running bond. Form concave 3/8 inch mortar joints.

### 3.03 PLACING AND BONDING

- A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints and deep or excessive furrowing of mortar joints are not permitted.
- B. Fully bond intersections, and external and internal corners.
- C. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- D. Remove excess mortar.
- E. Perform jobsite cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
- F. Provide masonry control joints as indicated on drawings or **as required to match existing conditions.**
- G. *Coordinate installation of brick with cast stone and anchors. Conduct preinstallation meeting to review dampproofing completion and method for assuring proper installation of masonry ties, control joints and sealant. Scaffolding shall not be removed until final inspection by Architect of brickwork and cast stone in place.*

### 3.04 TOLERANCES

- A. Alignment of Columns: Maximum 1/4 inch from true line.
- B. Variation from Unit to Adjacent Unit: 1/32 inch maximum.
- C. Variation from Plane of Wall; 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- D. Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.
- F. Variation of Joint Thickness: 1/8 inch in 3 feet.

- G. Maximum Variation from Cross Sectional Thickness of Walls: Plus or minus 1/4 inch.

### 3.05 REINFORCEMENT AND ANCHORAGES

- A. Multiple Wythe joint reinforcement.
- B. Install horizontal joint reinforcement 16 inches o.c.
- C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 16 inches each side of opening.
- D. Place joint reinforcement continuous in first and second joint below top of walls.
- E. Lap joint reinforcement ends minimum 6 inches. Extend 16 inches minimum each side of opening.
- F. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2 inch of true dimension.
- G. Verify that anchorages embedded in concrete and attached to structural steel members are properly placed. Embed anchorages in every second joint.
- H. Embed triangle wall ties in concrete at maximum 16 inches o.c. vertically and 32 inches o.c. horizontally. Place at maximum 3 inches o.c. each way around perimeter of openings, within 12 inches of openings. Anchor to concrete using dovetail anchor slots corrosion-resistant.
- I. Reinforce joint corners and intersections with strap anchors at 16 inches minimum spacing.

### 3.06 LINTELS

- A. Install loose steel lintels as indicated on Drawings.

### 3.07 CONTROL JOINTS

- A. Control And Expansion Joints:
  - 1. Install control and expansion joints at the following maximum spacings, unless otherwise indicated on Drawings:
    - a. Exterior Walls: 20 feet on center and within 24 inches on one side of each interior and exterior corner.
    - a. Interior Walls: 30 feet on center.
    - b. At changes in wall height.
  - 2. Do not continue horizontal joint reinforcement through control and expansion joints.
  - 3. Size control joint in accordance with Section 07951 for sealant performance.
  - 4. Form expansion joint by omitting mortar and cutting unit to form open space.

### 3.08 CAVITY WALL

- A. Do not let mortar fall into cavity air space or plug weep holes; clean out promptly.

- B. Install cavity vents and weep holes in veneer at **24 inches on center horizontally**, above through-wall flashing, above shelf angles, and at bottom of walls.
- C. Place **mortar drainage system** at all through- wall flashing , above shelf angles, and at bottom of walls.

### 3.09 BUILT-IN WORK

- A. As work progresses, build-in metal door frames, reinforcing, flashings, wood nailing strips, anchor bolts, plates, and other items to be built in the work supplied by other Sections.
- B. Build-in items plumb and level.
- C. Do not build-in organic materials subject to deterioration.

### 3.10 CUTTING AND FITTING

- A. Cut and fit for chases, pipes conduit, sleeves, grounds and other items which effect masonry. Cooperate with other Sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.
- C. Tooth new brick into existing masonry walls to match existing construction in all respects.

### 3.11 CLEANING

- A. Remove excess mortar and smears.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with a non-acidic solution which will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners.
- D. Use non-metallic tools in cleaning operations.

### 3.12 PROTECTION

- A. Protect finished installation under provisions of Section 01500.
- B. Maintain protective boards at exposed external corners which may be damaged by construction activities.
- C. Provide protection without damaging completed work.
- D. At day's end, cover unfinished walls to prevent moisture infiltration.

END OF SECTION

## Section 04720

### Architectural Cast Stone

#### PART 1 – GENERAL

##### 1.1. Section Includes - Architectural Cast Stone.

- A. Scope - Cast Stone shown on architectural drawings and as described in this specification.
  - a. Manufacturer shall furnish Cast Stone covered by this specification.
- B. See Section 04300 – Masonry & Cast Stone Sills, Bands & Trim. Coordinate work with this Section.

##### 1.2. Related Sections

- A. Section – 01300 – Submittal Procedures.
- B. Section – 04100 – Mortar.
- C. Section - 04220 - Concrete Masonry Units
- D. Section – 04300 – Masonry Grouting.
- E. Section – 07951 – Caulking & Sealants.

##### 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 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 - 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 refined architectural concrete building unit manufactured to simulate natural cut stone, used in Division 4 masonry applications.
  - a. Dry Cast – manufactured from zero slump concrete.
    - i. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.
    - ii. Machine casting method: Manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.

Wet Cast – manufactured from measurable slump concrete.

- iii. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

#### 1.5. Submittal Procedures

- A. Comply with Section 01300 – 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.
- D. Shop Drawings: Submit manufacturers shop drawings including profiles, cross-sections, reinforcement, exposed faces, arrangement of joints (optional for standard or semi-custom installations), anchoring methods, anchors, annotation of stone types and their location.
- E. Warranty: Submit Cast Stone Institute® Member Limited Warranty.
- F. Certification: Submit valid Cast Stone Institute® Plant Certification.

#### 1.6. Quality Assurance

- A. Manufacturer Qualifications:
  - a. Cast Stone shall be produced in a plant certified by the Cast Stone Institute®.
  - b. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
  - c. 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: Comply with the requirements of the Cast Stone Institute® Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.
- 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.
- D. Warranty Period: 10 years.

## PART 2 – MATERIALS

### 2.1. Architectural Cast Stone

- A. Comply with ASTM C 1364
- B. Physical properties: Provide the following:
  - a. Compressive Strength - ASTM C 1194: 6,500 psi minimum for products at 28 days.
  - b. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.
  - c. Air Content – ASTM C 173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.
  - d. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
  - e. 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 (14 m<sup>3</sup>) delivered to the job site.
  - a. 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.
  - b. Three field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
  - c. 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 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:
  - a. ASTM C 260 for air-entraining admixtures.
    - i. ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.
  - b. 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.
  - c. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
  - d. 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:
  - a. ASTM A 615/A 615M: Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in.
  - b. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.
- H. Fiber reinforcement (optional): ASTM C 1116
- 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

- A. Match sample on file in architect's office or match sample as approved for **Cast Stone as specified in Section 04300.**
- 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. and the density of such voids shall be less than 3 occurrences per any 1 in.<sup>2</sup> and not obvious under direct daylight illumination at a 5 ft distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft distance.
  - a. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
    - i. Total color difference – not greater than 6 units.
    - ii. Total hue difference – not greater than 2 units.
- D. 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.
- E. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- F. 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. (600 mm) in one direction shall be reinforced in that direction. Units less than 24 in. (600 mm) 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 warm curing chamber approximately 100°F (37.8°C) at 95 percent relative humidity for approximately 12 hours, or cure 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

- B. Cross section dimensions shall not deviate by more than  $\pm 1/8$  in. from approved dimensions.
- C. 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.
- D. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- E. Warp, bow or twist of units shall not exceed length/ 360 or  $\pm 1/8$  in., whichever is greater.
- F. 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.
- B. Test compressive strength and absorption from specimens taken from every 500 cubic feet of product produced.
- C. Perform tests in accordance ASTM C 1194 and C 1195.
- D. Have tests performed by an independent testing laboratory every six months.
- E. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.
- F. 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:
  - a. At stone/brick joints  $3/8$  in.
  - b. At stone/stone joints in vertical position 4 in. ( $3/8$  in. optional).
  - c. Stone/stone joints exposed on top  $3/8$  in.
- B. Joint materials:
  - a. Mortar, Type N, ASTM C 270.
  - b. Use a full bed of mortar at all bed joints.
  - c. Flush vertical joints full with mortar.
  - d. Leave all joints with exposed tops or under relieving angles open for sealant.

- e. Leave head joints in copings and projecting components open for sealant.
- C. Location of joints:
  - a. As shown on shop drawings.
  - b. 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 07951.
- 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.

#### 3.8. WATER REPELLENT

- A. Apply water repellent in accordance with Cast Stone Institute® Technical Bulletin #35 or water repellent manufacturer's directions.

END OF SECTION