

## SECTION 04220 - CONCRETE UNIT MASONRY

## PART 1 - GENERAL

## 1.01 DESCRIPTION:

- A. Work of this section is subject to requirements of the Contract Documents including the General Conditions and Supplementary Conditions and applicable portions of Division 1 - General Requirements.
- B. The work consists of all labor, materials and equipment necessary and required to complete all concrete unit masonry as shown on the drawings and specified herein.

## 1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Joint Sealers: Section 07900.
- B. Painting: Section 09900.
- C. Furnishing Mortar and Masonry Grout: Section 04100.
- D. Furnishing Masonry Accessories: Section 04150.
- E. Furnishing Bolts, Anchors and Nailers: Section 06100.
- F. Masonry Restoration and Cleaning: Section 04500.

## 1.03 QUALITY ASSURANCE

- A. Construction Tolerances: Comply with the allowable tolerances as set forth in NCMA-TEK 65, Field Inspection of Engineered Concrete Masonry.
- B. All concrete unit masonry work shall, except where more stringent requirements are shown or specified, be in accordance with Building Code Requirements for Masonry Structures (with Commentary) ACI 530-05/ASCE 5-05/TMS 402-05, and Specifications for Masonry Structures (with Commentary) ACI 530.1-05/ASCE 6-05/TMS 602-05.
- C. Inspecting Laboratory Qualifications: To qualify for employment in performing tests and inspection specified in this section, an independent testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory submitted criteria conforming to ASTM C 1093, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of the work.
- D. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- E. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surface.

## 1.04 SUBMITTALS

- A. Certificate: Furnish manufacturer certification that masonry units furnished meet or exceed the requirements of this specification.

- B. Test Reports:
1. Submit independent laboratory test reports for each type of concrete unit masonry.
  2. Include in Test Report:
    - a. Compression strength.
    - b. 24 hours cold water absorption.
    - c. 5 hour boil absorption.
    - d. Saturation coefficient.
    - e. Initial rate of absorption (suction).
- C. Manufacturer's recommended cleaning agent and application procedure.
- D. Shop Drawings: Submit shop drawings for fabrication, bending and placement of reinforcing bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures". Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies, as required, for fabrication and placement of reinforcing for unit masonry work.
- E. Samples: Submit to the Architect for approval, 5 individual samples of each type of concrete unit masonry showing the extreme variations in each color and texture
- 1.05 DELIVERY, STORAGE, AND HANDLING
- A. Store masonry units above ground on level platforms which allow air circulation under stacked units.
  - B. Cover and protect against wetting prior to use.
  - C. Handle units on pallets or flat bed barrows.
- 1.06 ENVIRONMENTAL CONDITIONS
- A. Cold Weather Protection:
    1. Preparation: Remove ice or snow formed on masonry bed by carefully applying heat when unit top surface is dry to touch. Remove frozen or damaged masonry. Use only dry masonry units. Do not use frozen units.
    2. No masonry shall be laid when the temperature is expected to fall below 40 degrees F, unless suitable means, approved in writing by the Architect, are provided to heat materials, protect work from cold and frost and insure that mortar will harden without freezing.
    3. Protection requirements for completed masonry and masonry not being worked on shall be in accordance with ACI 530.1-99/ASCE 6-99/TMS 602-99.
  - B. Hot Weather Protection:
    1. Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 99 degrees F in the shade with relative humidity less than 50 percent.
- 1.07 PROVISIONS FOR OTHER WORK
- A. Consult drawings and other contractors and provide chases, recesses, openings, anchors, for installation of later work, built-in wood bucks, nailing blocks, anchors, boxes, piping, sleeves, fixtures, flashing and various accessories, for own work or supplied or set by other contractors for their work, in a manner to avoid cutting and patching.

## 1.08 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following assembly installed minimum compressive strengths ( $f'm$ ):
1. For concrete unit masonry: As follows:
    - a.  $f'm = 1,500$  psi.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Concrete Masonry Units.
1. Hollow Load Bearing Units: ASTM C 90-00. Minimum compressive strength of 1,900 pounds per square inch for average of 3 units and 1,700 pounds per square inch for individual unit. Nominal face dimension of 8 inches  $\times$  16 inches. Fire rated units shall conform to governing codes.
  2. Solid Load Bearing Units: ASTM C 90-00. Net cross-sectional area of the unit in every plane parallel to bearing surface shall be not less than 75 percent solid. Minimum compression strength of 1,900 pounds per square inch for average of 3 units and 1,700 pounds per square inch for individual unit. Nominal face dimension of 8 inches  $\times$  16 inches. Fire-rated units shall conform to codes.
  3. Hollow Non-Load Bearing Units: ASTM C 129-00. Minimum compressive strength of 600 pounds per square inch for average of 3 units and 500 pounds per square inch for individual unit. Nominal face dimension of 8 inches  $\times$  16 inches. Fire rated units shall conform to governing codes.
  4. All exposed exterior corners at interior walls and partitions shall be bullnosed, except where otherwise indicated.
  5. All masonry units shall be made with lightweight aggregate conforming to ASTM C331, except cinders shall not be used. The units shall have a linear shrinkage of from 0.030 percent to 0.45 percent.
- B. Masonry Lintels:
1. Provide masonry lintels where shown and wherever openings of more than 1 foot are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Thoroughly cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.
  2. Unless otherwise shown, provide one reinforcing bar for each 4 inches of wall thickness and of a size number not less than the number of feet of opening width.
  3. For hollow concrete masonry unit walls, use specially formed "U" shaped lintel units with reinforcing bars placed as shown and filled with Type S mortar or concrete grout.
  4. Provide minimum bearing at each jamb, or 4 inches for openings less than 6 feet wide, and 8 inches for wider openings.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Lay only dry masonry units, using mortars as specified in Section 04100.

1. Use Type N mortar at all locations, unless otherwise noted.
- B. Use masonry saws to cut and fit masonry units.
- C. Bond: Running bond with vertical joints located at center of masonry units in alternate course below, unless otherwise shown.
- D. Set units plumb, true to line, and with level courses accurately spaced.
- E. Adjust masonry units to final position while mortar is soft and plastic.
- F. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar and re-lay with fresh mortar.
- G. When joining fresh masonry to set or partially set masonry construction, clean exposed surface of set masonry and remove loose mortar prior to laying fresh masonry. If necessary to stop off a horizontal run of masonry, rack back one-half block length in each course.
- H. Do not use toothing to join new masonry to set or partially set masonry when continuing a horizontal run.
- I. All new masonry walls and partitions in existing areas of building shall extend up to underside of construction above, unless shown or noted otherwise.

### 3.02 PROTECTION OF WORK

- A. Protect ledges and off-sets from mortar drippings or other damage during construction.
- B. Remove misplaced mortar or grout immediately.
- C. Protect face materials against staining.
- D. Cover top of walls with non-staining waterproof coverings at end of each day or shutdown.
- E. Do not apply uniform floor or roof loading for at least twelve hours after completing masonry columns or walls.
- F. Do not apply concentrated loads for at least three days after completing masonry columns or walls.

### 3.03 MORTAR BEDS

- A. Hollow Units:
  1. Lay with full mortar coverage on horizontal and vertical face shells.
  2. Provide full mortar coverage on horizontal and vertical face shells and webs in all courses of following:
    - a. Where adjacent to cells or cavities to be filled with grout.
    - b. Starting course on footings and solid foundation walls.
    - c. Piers, columns and pilasters.
- B. Solid Units:
  1. Lay with full mortar coverage on horizontal and vertical joints.

### 3.04 HORIZONTAL AND VERTICAL FACE JOINTS

- A. Nominal thickness: 3/8 inch.
- B. Construct uniform joints.
- C. Shove vertical joints tight.

- D. Point joints tight in masonry below ground.
- E. Tool joints in exposed or to be painted surfaces when thumb-print hard with concave jointer.
- F. Tool joints in unexposed surfaces, including surfaces above ceilings, when thumb-print hard with concave jointer.
- G. Fully grout all hollow metal frames in masonry partitions.
- H. Remove mortar protruding into cells of cavities to be reinforced or filled.
- I. Strike joints flush in surfaces to be covered with other masonry, or other surface applied finish other than paint.

### 3.05 BONDING

- A. Bonding of abutting or intersection walls and partitions.
  1. Lay at least 50 percent of units at intersection in masonry bond.
  2. Minimum bearing of alternate units: 3 inches on unit below.
  3. Corner intersection of walls carried up separately.
    - a. Provide regular toothing or blocking with maximum offset of 8 inches.
    - b. Install rigid steel anchors at maximum vertical spacing of 2 feet.

### 3.06 INSTALLATION OF REINFORCING

- A. Install masonry reinforcing in first course and 16 inches o.c. vertically. Use prefabricated inside and outside corners.
- B. The top course of all masonry walls and the first two courses above and below all wall openings shall be reinforced. The reinforcement at openings shall extend not less than 18 inches beyond each side of the opening.

### 3.07 INSTALLATION OF METAL TIES

- A. Use individual metal ties embedded in horizontal joints to bond wythes together. Provide ties as shown, but not less than one metal tie for 4 square feet of wall area spaced not to exceed 24 inches o.c. horizontally and vertically. Stagger ties in alternate courses. Provide additional ties within 1 foot of all openings and space not more than 3 feet apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inch o.c. vertically.

### 3.08 BUILT-IN WORK

- A. Avoid cutting and patching as much as possible.
- B. Install bolts, anchors, inserts, frames and other built-in items as masonry work progresses.
- C. Solidly grout spaces around built-in items.
- D. Minimum installation distance from jambs of openings: One concrete masonry unit length.

### 3.09 CONTROL AND EXPANSION JOINTS

- A. Install vertical expansion and control joints in exterior and interior masonry where shown or required. Build-in related masonry accessory items as the masonry work progresses.
  1. Provide vertical control joints in masonry wall without openings according to the following parameters:
    - a. With horizontal reinforcing at 16" intervals, provide control joints

spaced at no more than a panel length to height ratio of 3, but not to exceed 50 feet.

2. Provide vertical control joints in the following specific locations:
  - a. Changes in wall height or thickness.
  - b. At construction joints in foundation, in roof, and in floors.
  - c. At chases and recesses for piping, columns, fixtures, etc.
  - d. At abutment of wall and columns/piers.
  - e. At return angles in "L", "T", and "U" shaped structures.
  - f. At one or both jambs of wall openings (above and below as applicable).
  - g. On one of the walls within 2 feet of any outside corner.
3. Where concrete masonry is used as backup of other materials:
  - a. Extend control joints through facing if it is rigidly bonded to the concrete masonry (as with a masonry bond).
  - b. Control joints need not extend through facing when bond is flexible (as with metal ties).
4. Consult with Architect prior to installing walls and partitions to finalize control joint locations required by parameters listed here, but not indicated on the drawings.

### 3.10 POINTING AND CLEANING

- A. At final completion of concrete unit masonry work fill holes in joints and tool. Do not fill weep holes.
- B. Cut out and repoint defective joints.
- C. Dry brush masonry surface after mortar has set, at end of each day's work and after final pointing.
- D. Leave work and surrounding surfaces clean and free of mortar spots and droppings.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5,000 square feet of wall area or portion thereof.
  1. Mortar properties will be tested per property specification of ASTM C 270.
  2. Mortar composition and properties will be evaluated per ASTM C 780.
  3. Grout compressive strength will be sampled and tested per ASTM C 1019.
- B. Prism Test Method: For each type of wall construction indicated, masonry prisms will be tested for (f'm) compressive strength per ASTM E 447, Method B, and as follows:
  1. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.
- C. Evaluation of Quality Control Tests: In absence of other indications of non-compliance with requirements, masonry will be considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.

END OF SECTION 04220