

**Division 4**  
Masonry



## SECTION 04810

### UNIT MASONRY ASSEMBLIES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
1. Concrete masonry units.
  2. Mortar and grout.
  3. Reinforcing steel.
  4. Masonry joint reinforcement.
  5. Ties and anchors.
  6. Embedded flashing.
  7. Miscellaneous masonry accessories.

##### 1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following net-area compressive strengths ( $f'_m$ ) at 28 days. Determine compressive strength of masonry from net-area compressive strengths of masonry units and mortar types according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
1. For Concrete Unit Masonry:  $f'_m = 1500$  psi.
  2. For Brick Unit Masonry:  $f'_m = 2000$  psi.

##### 1.5 SUBMITTALS

- A. Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

**B. For Review:**

1. **Product Data:** For each different masonry unit, accessory, and other manufactured product specified.
2. **Shop Drawings:** Show fabrication and installation details for the following:
  - a. **Reinforcing Steel:** Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of concrete Reinforcement."
3. **Samples for Initial Selection:** For the following:
  - a. **Brick Samples:** Showing full range of colors and textures available for each different exposed masonry unit required.

**C. For Information Only:**

1. **Qualification Data:** For firms and person specified in "Quality Assurance" Article.
2. **Material Test Reports:** From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
  - a. Each type of masonry unit required.
  - b. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
  - c. Include test results, measurements and calculations establishing net-area compressive strength of masonry units.
  - d. Mortar complying with property requirements of ASTM C 270.
  - e. Grout mixes comply with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.
3. **Material Certificates:** Signed by manufacturers certifying that each of the following items complies with requirements:
  - a. Each type of masonry unit required.
    - 1) Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
    - 2) Include test data, measurements and calculations establishing net-area compressive strength of masonry units.
  - b. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
  - c. Each combination of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
  - d. Each material and grade indicated for reinforcing bars.

- e. Each type and size of joint reinforcement.
- f. Each type and size of anchor, tie, and metal accessory.

## 1.6 QUALITY ASSURANCE

- A. **Testing Agency Qualifications:** An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
- B. **Source Limitations for Masonry Units:** Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. **Source Limitation for Mortar Materials:** Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source of producer for each aggregate.
  - 1. **Grout Test:** For compressive strength per ASTM C 1019.
- D. **Fire-Resistance Ratings:** Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- E. **Sample Panels:** Before installing unit masonry, build sample panels, using materials indicated for completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build sample panels for each type of exposed unit masonry assembly in sizes approximately 48 inches long by 48 inches high by full thickness.
  - 1. Locate panels in the locations indicated or, if not indicated, as directed by Architect.
  - 2. Clean exposed faces of panels with masonry cleaner indicated.
  - 3. Protect approved sample panels from the elements with weather-resistant membrane.
  - 4. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
  - 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
    - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless Architect specifically approves such deviations in writing.
  - 6. Demolish and remove sample panels when directed.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
  - 1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Deliver preblended, dry mortar mix in moisture-resistant container designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## **1.8 PROJECT CONDITIONS**

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surfaces.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg. F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

## **PART 2 - PRODUCTS**

### **2.1 CONCRETE MASONRY UNITS**

- A. Concrete Masonry Units: ASTM C 90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
  2. Weight Classification:
    - a. Light weight at interior
    - b. Normal weight at exterior where exposed to element.
  3. Provide Type I, moisture-controlled units.
  4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
  5. See Structural Drawings for other data.

### **2.2 REINFORCING STEEL**

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/a 617M, Grade 60.

### **2.3 MASONRY JOINT REINFORCEMENT**

- A. General: ASTM A 951 and as follows:
1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
  2. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.

3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
  4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.

## **2.4 TIES AND ANCHORS, GENERAL**

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60, commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.
- D. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbonsteel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
- E. Steel Plate, Shapes, and Bars: ASTM A 36/A 36M.

## **2.5 ANCHORS FOR CONNECTING TO CONCRETE**

- A. Provide two piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section: Dovetail anchor section formed from 0.0966 inch thick, steel sheet galvanized after fabrication.
  2. Tie Section; Triangular shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25 inch diameter, hot-dip galvanized steel.
- B. Product:
1. Dur-O-Wal, Inc.; Product DA 720 series.
  2. Heckman Building Products Inc.; Product 103 Triangular Tie.
  3. Hohman & Barnard, Inc.; Product #315 Flexible Dovetail Brick Tie.

## **2.6 RIGID ANCHORS**

- A. General: Fabricate from steel bars as follows:
1. 1-1/2 inches wide by ¼ inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.
  2. Finish: Hot dip galvanized to comply with ASTM A 153.

## 2.7 EMBEDDED FLASHING MATERIALS

- A. Concealed Flashing: For flashing not exposed to the exterior, use the following unless otherwise indicated:
  - 1. Copper-Laminated Flashing: Manufacturer's standard laminate flashing consisting of 5-oz./sq. ft. sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
- B. Adhesives, Primers, and Seam Tapes of Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
- C. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Copper-Laminated Flashing:
    - a. Copper Fabric: AFCO Products, Inc.
    - b. H&B C-Fab Flashing; Hohmann & Barnard, Inc.
    - c. Type FCC Fabric Covered Copper; Phoenix Building Products.
    - d. Copper Fabric Flashing: Sandell Manufacturing Co., Inc.
    - e. York Copper Fabric Flashing: York Manufacturing, Inc.

## 2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Performed Control-Joint Gaskets; Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated provide one of the following:
  - 1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
  - 2. PVC: ASTM D 2287, Type PVC-65406.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type 1 (No. 15 asphalt felt).
- D. Wicking Material: Cotton or polyester rope, ¼ to 3/8 inch diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity between wythes.
- E. Cavity Drainage Material: Pea gravel, clean, dry conforming to ASTM D 1863.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
  - 2. Verify that foundations are within tolerance specified.
  - 3. Verify that reinforcing dowels are properly placed.
  - 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping conditions.

### **3.2 INSTALLATION, GENERAL**

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of unit is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  - 1. Mix units from several pallets or cubes as they are placed.

### **3.3 CONSTRUCTION TOLERANCES**

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than  $\frac{1}{4}$  inch in 20 feet, nor  $\frac{1}{2}$  inch maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than  $\frac{1}{4}$  inch in 10 feet, nor  $\frac{1}{2}$  inch maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than  $\frac{1}{4}$  inch in 20 feet, nor  $\frac{1}{2}$  inch maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus  $\frac{1}{8}$  inch, with a maximum thickness limited to  $\frac{1}{2}$  inch. Do not vary from bedjoint thickness of adjacent courses by more than  $\frac{1}{8}$  inch.

### 3.4 LAYING MASONRY FOUNDATION WALLS

- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern: do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
  - 1. One-half running bond with vertical joint in each course centered on units in courses above and below. Where scored units are provided, center score on mortar joint above and below.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. At fire-rated partition, install firestopping in joint between top of partition and underside of structure.

### **3.5 MORTAR BEDDING AND JOINTING**

- A. Lay hollow masonry units as follows:
  - 1. With full mortar coverage on horizontal and vertical face shells.
  - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
  - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Tool Exposed Joints:
  - 1. CMU: Slightly concave when thumbprint hard, using a joint larger than the joint thickness.

### **3.6 MASONRY JOINT REINFORCEMENT**

- A. Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches o.c.
  - 2. Space reinforcement not more than 8 inches o.c. in parapet walls.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
    - a. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### **3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS**

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
  2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
  3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### **3.8 CONTROL AND EXPANSION JOINTS**

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces.
  2. Install preformed control-joint gaskets designed to fit standard sash block.
  3. Install interlocking units designed for control joints. Install bond breaker strips at joint. Keep head joints free and clear of mortar or rake joint.
  4. Install temporary foam plastic filler in head joints and remove filler when unit masonry is complete.
- C. Form expansion joints in brick made from clay or shale as follows:
1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.
  2. Build flanges of factor-fabricated, expansion joint units into masonry.
  3. Build in joint fillers where indicated.
  4. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.

### **3.9 REINFORCED UNIT MASONRY INSTALLATION**

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
  - 1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
  - 1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for minimum grout space and maximum pour height of four feet, stop each lift 2 inches below top of in progress wall level.

### **3.10 FIELD QUALITY CONTROL**

- A. Owner will engage a qualified independent testing agency to perform field quality-control testing.

### **3.11 REPAIRING, POINTING, AND CLEANING**

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

**END OF SECTION 04810**