

## SECTION 04810 - UNIT MASONRY ASSEMBLIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Contract Drawings and general provisions of the Construction Contract, including Contract Clauses and Conditions (CC &C), Supplemental Contract Clauses and Conditions, and Division 1 sections of these Contract Specifications, apply to work of this Section.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Dovetail slots for masonry anchors, installed under Division 3 Section "Cast-in-Place Concrete."
- C. Products installed, but not furnished, under this Section include the following:
  - 1. Steel lintels and shelf angles for unit masonry, furnished under Section 05500, "Metal Fabrications."
  - 2. Manufactured reglets in masonry joints for metal flashing, furnished under Section 07620, "Sheet Metal Flashing and Trim."
  - 3. Hollow-metal frames in unit masonry openings, furnished under Section 08110, "Steel Doors and Frames."
  - 4. Firestopping, at fire-rated partitions, furnished under Section 07841, "Through-Penetration Firestop Systems."

#### 1.2 SUMMARY

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

#### 1.3 DEFINITIONS

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

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops the following net-area compressive strengths (f'm) at 28 days.

- B. Determine net-area compressive strength ( $f'_m$ ) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
  - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  - 2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
  - 3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
  - 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection: For the following:
  - 1. Decorative concrete masonry units, in the form of small-scale units.
  - 2. Colored mortar.
  - 3. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
  - 1. Exposed concrete masonry units.
  - 2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
  - 3. Stone trim.
  - 4. Weep holes/vents.
  - 5. Accessories embedded in masonry.
- E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
  - 1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
  - 2. Cementitious materials. Include brand, type, and name of manufacturer.
  - 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  - 4. Grout mixes. Include description of type and proportions of ingredients.
  - 5. Reinforcing bars.
  - 6. Joint reinforcement.
  - 7. Anchors, ties, and metal accessories.

- F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
  - 1. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

#### 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 Limitations 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 or producer for each aggregate.
- D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the following preconstruction testing:
  - 1. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per ASTM C 140.
  - 2. Mortar Test: For mortar properties per ASTM C 270.
  - 3. Grout Test: For compressive strength per ASTM C 1019.
- E. 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.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements.

#### 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.
- B. Store cementitious materials on elevated platforms under cover and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

- 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 600 mm 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 600 mm down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry that will 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 surface.
  - 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. 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. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  - 1. When ambient temperature exceeds 38 deg C, or 32 deg C with a wind velocity greater than 13 km/h, do not spread mortar beds more than 1200 mm ahead of masonry. Set masonry units within one minute of spreading mortar.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

## 2.2 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
  - 1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
  - 2. Provide square-edged units for outside corners, unless indicated as bullnose.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
  - 1. Weight Classification: Medium weight, unless otherwise indicated.

## 2.3 CONCRETE AND MASONRY LINTELS

- A. General: Provide concrete or masonry lintels where indicated on the Construction Drawings, or if not, at Contractor's option, complying with requirements below.
- B. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.
- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 3 Section "Cast-in-Place Concrete."
- D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.4 STONE TRIM UNITS

- A. Granite: ASTM C 615.
  - 1. Description: Medium-grained, white stone. Uniform patterning, without veining.
- B. Finish: Honed, unless otherwise indicated.
- C. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces.
  - 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."

## 2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.

- C. Mortar Cement: ASTM C 1329.
  - 1. For pigmented mortar, use a colored cement formulation as required to produce the color indicated or, if not indicated, as selected from manufacturer's standard formulations.
    - a. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.
  - 2. For colored-aggregate mortar, use natural color or white cement as necessary to produce required mortar color.
- D. Aggregate for Mortar: ASTM C 144; except for joints less than 6.5 mm thick, use aggregate graded with 100 percent passing the 1.18-mm sieve.
  - 1. White-Mortar Aggregates: Natural white sand or ground white stone.
  - 2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- E. Aggregate for Grout: ASTM C 404.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- G. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of the units); in color indicated or, if not otherwise indicated, as selected by COR Representative from manufacturer's colors.
- H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
- I. Water: Potable.

## 2.6 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951.
  - 1. Interior Walls: Mill- galvanized, carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
  - 3. Wire Size for Side Rods: W1.7 or 0.148-inch (3.8-mm) diameter.
  - 4. Wire Size for Cross Rods: W1.7 or 0.148-inch (3.8-mm) diameter.
  - 5. Wire Size for Veneer Ties: W1.7 or 0.148-inch (3.8-mm) diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
  - 7. Provide in lengths of not less than 10 feet (3 m).
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches (100 mm) in width, plus 1 side rod at each wythe of masonry 4 inches (100 mm) or less in width.
2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.

E. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.188-inch- (4.8-mm-) diameter, hot-dip galvanized, carbon -steel continuous wire.

2.7 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. Stainless-Steel Wire: ASTM A 580/A 580M, Type 316.
- D. Stainless-Steel Sheet: ASTM A 666, Type 316.
- E. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.8 ANCHORS FOR CONNECTING TO CONCRETE

- A. General: 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 2.5-mm-thick steel sheet, galvanized after fabrication or 1.6-mm-thick, stainless-steel sheet 2.8-mm-thick stainless-steel sheet.
  2. Tie Section: Triangular-shaped wire tie, sized to extend within 25 mm of masonry face, made from 6.4-mm-diameter, stainless-steel wire.

2.9 RIGID ANCHORS

- A. General: Fabricate from steel bars as follows:
  1. 38 mm wide by 6.4 mm thick by 600 mm long, with ends turned up 50 mm or with cross pins.
  2. Finish: Hot-dip galvanized to comply with ASTM A 153.

## 2.10 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.
- B. Dovetail Slots: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.85-mm galvanized steel sheet.
- C. Anchor Bolts: Steel bolts complying with ASTM F 568, Property Class 4.6; with ASTM A 563M hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
  - 1. Headed bolts.
- D. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
  - 1. Type: Chemical anchors.
  - 2. Corrosion Protection: Stainless-steel components complying with ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

## 2.11 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:
  - 1. Copper: 3-kg/sq. m weight or 0.34 mm thick for fully concealed flashing; 5-kg/sq. m weight or 0.55 mm thick elsewhere.
  - 2. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above and with ribs at 75-mm intervals along length of flashing to provide an integral mortar bond.
  - 3. Fabricate metal expansion-joint strips from sheet metal indicated above, formed to shape indicated.
  - 4. Fabricate metal flashing terminations from sheet metal indicated above. Extend at least 75 mm into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 19 mm and then down into joint 10 mm to form a stop for retaining sealant backer rod.
- B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.12 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 or urethane.
- B. Preformed 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.
  - 1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 9-mm OD by 100 mm long.
- E. Wicking Material: Cotton or polyester rope, 6 to 10 mm in diameter, in length required to produce 50-mm exposure on exterior and 450 mm in cavity between wythes.
- F. Cavity Drainage Material: 19-mm- or 25-mm- thick, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.
- G. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 3.6-mm or 4.8-mm steel wire, hot-dip galvanized after fabrication.
  - 1. Provide units with either two loops or four loops as needed for number of bars indicated.
- H. Adhesive: Type recommended by insulation board manufacturer for application indicated.

## 2.13 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 0.14-L dry measure tetrasodium polyphosphate and 0.14-L dry measure laundry detergent dissolved in 4 L of water.

## 2.14 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
  - 1. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement, mortar cement, and lime.
  - 2. For masonry below grade, in contact with earth, and where indicated, use Type S or RS.

3. For reinforced masonry and where indicated, use Type S or RS.
  4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N or RN.
- C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:
1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
  2. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  2. Provide grout with a slump of 200 to 280 mm as measured according to ASTM C 143.
- F. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's directions.

## 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 tolerances 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 connections.

### 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 units 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.
- F. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
  - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
  - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
  - 3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
  - 4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
  - 5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
  - 6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.
  - 7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

### 3.3 LAYING MASONRY WALLS

- A. Lay out 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 bond pattern indicated; do not use units with less than nominal 100-mm horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 50 mm. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 100-mm 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, unless otherwise indicated provide thermal break as required.
- 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 600 mm under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-loadbearing 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 partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section for firestopping.

### 3.4 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. Set stone trim units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone-joint surface thoroughly before setting; for soiled stone surfaces, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.

### 3.5 CAVITIES

- A. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

### 3.6 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 16 mm on exterior side of walls, 13 mm elsewhere. Lap reinforcement a minimum of 150 mm.
  - 1. Space reinforcement not more than 406 mm o.c.

2. Space reinforcement not more than 203 mm o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 203 mm above and below wall openings and extending 305 mm 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 VENEERS

- A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
  1. Fasten each anchor section to concrete and masonry backup with two metal fasteners of type indicated.
  2. Embed connector sections and continuous wire in masonry joints. Provide not less than 50 mm of air space between back of masonry veneer and face of sheathing.
  3. Locate anchor sections to allow maximum vertical differential movement of ties up and down as required.
  4. Space anchors as indicated, but not more than 458 mm o.c. vertically and 610 mm o.c. horizontally, with not less than 1 anchor for each 0.2 sq. m of wall area. Install additional anchors within 305 mm of openings and at intervals, not exceeding 203 mm, around the perimeter.

### 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. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."
  1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

### 3.9 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 305 mm for brick-size units and 610 mm for block-size units are shown without structural steel or other supporting lintels.
  - 1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
- C. Provide minimum bearing of 200 mm at each jamb, unless otherwise indicated.

### 3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
  - 1. At multiwythe masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of 100 mm and through inner wythe to within 13 mm of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through inner wythe and turn flashing up approximately 50 mm, unless otherwise indicated.
  - 2. At lintels and shelf angles, extend flashing a minimum of 100 mm into masonry at each end. At heads and sills, extend flashing 100 mm at ends and turn flashing up not less than 50 mm to form a pan.
  - 3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 38 mm or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
  - 4. Extend sheet metal flashing 13 mm beyond face of masonry at exterior and turn flashing down to form a drip.
  - 5. Install metal drip edges beneath flashing at exterior face of wall. Stop flashing 13 mm back from outside face of wall and adhere flashing to top of metal drip edge.
  - 6. Cut flashing off flush with face of wall after masonry wall construction is completed.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
  - 1. Use plastic weep hole/vents or wicking material to form weep holes.

2. Use wicking material to form weep holes above flashing in brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
  3. Space weep holes formed from plastic tubing or wicking material 400 mm o.c.
- E. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
- F. Install vents in vertical head joints at the top of each continuous cavity at spacing indicated. Use round plastic tubing or to form vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.
- G. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

### 3.11 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 cleanouts and for grout placement, including minimum grout space and maximum pour height.

### 3.12 FIELD QUALITY CONTROL

- A. Inspectors: Engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
- B. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
1. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
- C. Testing Frequency: One set of tests for each 450 sq.m of wall area or portion thereof.

- D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

### 3.13 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.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Government's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
  - 5. Clean Stone units to comply with stone supplier's written instructions.

END OF SECTION 04810