

SECTION 042000 - UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Lintels.
 - 3. Brick.
 - 4. Mortar and grout materials.
 - 5. Reinforcement.
 - 6. Ties and anchors.
 - 7. Embedded flashing.
 - 8. Accessories.
 - 9. Mortar and grout mixes.
- B. Products Installed but not Furnished under This Section:
 - 1. Steel lintels in unit masonry.
 - 2. Steel shelf angles for supporting unit masonry.
 - 3. Cavity wall insulation adhered to masonry backup.
- C. Related Requirements:
 - 1. Section 047200 "Cast Stone Masonry" for cast stone set in masonry.
 - 2. Section 047314 "Manufactured Architectural Stone Masonry" for Architectural stone masonry veneer units.
 - 3. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
 - 4. Section 055000 "Metal Fabrications" for steel lintels and shelf angles set in unit masonry.
 - 5. Section 072726 "Fluid Applied Membrane Air Barriers" for air barriers installed in cavity walls.
 - 6. Section 077100 "Roof Specialties" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Indicate elevations of reinforced walls.
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:
 - 1. Clay face brick, in the form of straps of five or more bricks.
 - 2. Colored mortar.
- D. Samples for Verification: For each type and color of the following:
 - 1. Clay face brick, in the form of straps of five or more bricks.
 - 2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.5 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Material Certificates: For each type of the following:
 - 1. Masonry units.
 - a. Include data on material properties and material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence in accordance with ASTM C67/C67M.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 5. Grout mixes. Include description of type and proportions of ingredients.
 - 6. Reinforcing bars.
 - 7. Joint reinforcement.
 - 8. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 - 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- D. 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 in accordance with TMS 602.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

1.7 MOCKUPS

- A. Wall Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution and to set quality standards for installation.
 - 1. Build mockups for typical exterior wall in sizes approximately 48 inches (1219.2 mm) long by 48 inches high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches (406.4 mm) long in exterior wall mockup.

- b. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches (406.4 mm) down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - c. Where applicable, include metal studs, sheathing, sheathing joint-and-penetration treatment, air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
 3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 4. Protect accepted mockups from the elements with weather-resistant membrane.
 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations by Change Order.

1.8 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. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD 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 (609.6 mm) down both sides of walls, 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 (609.6 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 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 spreading coverings 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. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost

or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 PRODUCTS

2.1 SOURCE LIMITATIONS

- A. For exposed masonry units and cementitious mortar components, obtain each color and grade from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) in accordance with TMS 602.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet (609.6 cm) vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
1. Where fire-resistance-rated construction is indicated, use the equivalent thickness method for masonry units in accordance with ACI 216.1. If size and aggregate type fail to meet equivalent thickness required, U.L. certified rated CMU shall be provided.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C90, lightweight.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13100.04 kPa) unless noted otherwise.
 - a. At all 12" CMU wall/partitions, provide units with minimum average net-area compressive strength of 2800 psi (19305.33 kPa).
 2. Size (Width): Manufactured to dimensions 3/8 inch (9.52 mm) less than nominal dimensions.
 - a. Units shall be 8" x 16" face dimensions and 4 inch (101.6 mm), 6 inch (152.4 mm), 8 inch (203.2 mm) and 12 inch (304.8 mm) thicknesses as shown on drawings.

2.5 LINTELS

- A. Masonry Lintels: Built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.

B. Precast-U-Lintels:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Cast Crete; U-Lintels or a comparable product by another manufacturer.
2. Size: Provide lintels to match thickness of CMU partition in lengths required for opening and bearing required by manufacturer.
3. Lintels to be constructed of 6000 psi (41368.56 kPa) concrete, rebar complying with ASTM 615, Grade 60, wire per ASTM A510.
4. Units shall be grey, smooth formed.

2.6 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels and where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C216, Grade SW, Type FBS.
1. Brick shall match existing as approved by Architect.
 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi (20684.28 kPa).
 3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M.
 4. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
 5. Application: Use where brick is exposed unless otherwise indicated.
 6. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
 - a. Brick :
 - 1) Triangle Brick Red Common Prod. No. 100
 - 2) North Georgia Brick MS Columbus Select Smooth Red
- C. Building (Common) Brick: ASTM C62, Grade SW.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23097.45 kPa).
 2. Size (Actual Dimensions): Match size of face brick.
 3. Application: Use where brick is indicated for concealed locations. Face brick complying with requirements for grade, compressive strength, and size indicated for building brick may be substituted for building brick.

2.7 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, 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.
1. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Masonry Cement: ASTM C91/C91M.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

- E. Colored Cement Products: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Colored Masonry Cement:
 - a. Argos USA LLC
 - b. Cemex S.A.B. de C.V.D.
 - c. Holcim (US) Inc.
 - d. National Cement; A Vicat Company.
 - 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 3. Pigments do not exceed 5 percent of masonry cement by weight.
 - 4. Color: As selected by architect from manufacturer's full range.
 - a. Architect may select separated colors to match each brick color and/or stone color.
- F. Aggregate for Mortar: ASTM C144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch (6.35 mm) thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
- G. Aggregate for Grout: ASTM C404.
- H. Water: Potable.

2.8 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
 - 1. Interior Walls: Mill- galvanized carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.187-inch diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (406.4 mm) o.c.
 - 7. Provide in lengths of not less than 10 feet (304.8 cm) , with prefabricated corner and tee units.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
- E. Masonry-Joint Reinforcement for Multiwythe Masonry:
 - 1. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch (1.59 mm) and maximum vertical adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

2.9 TIES AND ANCHORS

- A. General: Ties and anchors extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A641/A641M, Class 1 coating.

2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A153/A153M, Class B-2 coating.
 3. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 zinc coating.
 4. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 5. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- thick steel sheet, galvanized after fabrication.
 - a. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- E. Partition Top Anchors: See structural drawings for anchoring tops of partitions to structure.
- F. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist a 100 lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.59 mm).
 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.0785-inch- thick steel sheet, galvanized after fabrication.
 3. Fabricate wire ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 4. Masonry-Veneer Anchors; Double-Pintle Plate: Rib-stiffened, sheet metal anchor section with screw holes at top and bottom, projecting horizontal leg with slots for vertical legs of double pintle wire tie. Projecting horizontal leg length shall be coordinated with specified insulation thickness.
 5. Contractor's option: Anchors, ties, and metal accessories.
 - a. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours in accordance with ASTM B117.
 - b. Stainless Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless steel shank.

2.10 EMBEDDED FLASHING

- A. Flexible Flashing: Use the following unless otherwise indicated:
1. Stainless Steel Fabric Flashing: Composite, flashing product consisting of minimum 2-mil of Type 304 stainless steel sheet, bonded to a layer of polymeric fabric.

- B. Flashing Corners and End Dams: Provide 304 stainless steel soldered corners and end dams by same manufacturer as stainless steel flashing to seal off corners and ends of flashing.
- C. Drip Edge: Provide 304 stainless steel drip plate (flat) with factory hemmed edge for thru-wall applications of flashing.
- D. Sealants for Sheet Metal Flashings:
 - 1. Elastomeric Sealant: ASTM C920, chemically curing sealant; of type, grade, class, and use classifications required by manufacturer to seal joints in sheet metal flashing and remain watertight.
- E. Termination Bars for Flexible Flashing, Flanged: Stainless steel sheet 0.019 inch (0.48 mm) by 1-1/2 inches (38 mm) with a 3/8-inch flange at top.

2.11 ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
- D. Weep: Use the following unless otherwise indicated:
 - 1. Wicking Material: Absorbent rope, made from cotton, 1/4 to 3/8 inch (9.52 mm) in diameter, in length required to produce 2-inch exposure on exterior and 18 inches (457.2 mm) in cavity. Use only for weeps.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Mortar Deflector: Strips, full depth of cavity and 10 inches (254 mm) high, with dovetail-shaped notches that prevent clogging with mortar droppings.
- F. Proprietary Acidic Masonry Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.12 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. Use portland cement-lime mortar unless otherwise indicated.
 - 3. For masonry veneer, use masonry cement mortar.
- B. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For CMU masonry, use Type S.
 - 3. For brick or stone veneer, use Type N.
- C. Pigmented Mortar: Use colored cement product. Do not add pigments to colored cement products.
 - 1. Pigments do not exceed 5 percent of masonry cement by weight.
 - 2. Mix to match Architect's approved sample(s).
 - 3. Application: Use pigmented mortar for exposed mortar joints with the following units:

- a. Decorative CMUs.
 - b. Clay face brick.
 - c. Cast-stone trim units.
 - d. Stone masonry.
- D. Grout for Unit Masonry: Comply with ASTM C476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.1.2 for specified 28-day compressive strength indicated, but not less than 3000 psi (20684.28 kPa).
 3. Provide grout with a slump of 8 to 11 inches (279.4 mm) as measured in accordance with ASTM C143/C143M.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying 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. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12.7 mm) or minus 1/4 inch (6.35 mm).
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12.7 mm).
 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6.35 mm) in a story height or 1/2 inch (12.7 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm), or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch (3.18 mm) in 10 feet (304.8 cm), 1/4 inch (6.35 mm) in 20 feet (609.6 cm), or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm), 3/8 inch (9.52 mm) in 20 feet (609.6 cm), or 1/2-inch maximum.
4. 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 (3.18 mm) in 10 feet (304.8 cm), 1/4 inch (6.35 mm) in 20 feet (609.6 cm), or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm), 3/8 inch (9.52 mm) in 20 feet (609.6 cm), or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch (6.35 mm) in 10 feet (304.8 cm), or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.59 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3.18 mm), with a maximum thickness limited to 1/2 inch (12.7 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3.18 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9.52 mm) or minus 1/4 inch (6.35 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3.18 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.59 mm) from one masonry unit to the next.

3.4 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: Unless otherwise indicated, lay exposed masonry in running bond,, ; do not use units with less-than-nominal 4-inch 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 4 inches (101.6 mm). 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: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

- H. Fill cores in hollow CMUs with grout 24 inches (609.6 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition.
 - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set stone and cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Allow cleaned surfaces to dry before setting.
 - 3. Wet joint surfaces thoroughly before applying mortar.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- F. Cut joints flush where indicated to receive waterproofing, cavity wall insulation, and air barriers unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together as follows:
 - 1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement to allow for differential movement regardless of whether bed joints align.
 - 2. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. 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.
- C. Apply air barrier to face of backup wythe to comply with Section 072726 "Fluid-Applied Membrane Air Barriers."

3.7 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 2. Embed tie sections in masonry joints.
 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 4. Space anchors as indicated, but not more than 16 inches (406.4 mm) o.c. vertically and 24 inches (609.6 mm) o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches (304.8 mm) of openings and at intervals, not exceeding 8 inches (203.2 mm), around perimeter.
- B. Match existing airspace size between back of masonry veneer and face of interior wall.
1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.8 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (15.88 mm) on exterior side of walls, 1/2 inch (12.7 mm) elsewhere. Lap reinforcement a minimum of 6 inches (152.4 mm).
1. Begin joint reinforcement at first joint above finished floor elevation.
 2. Space reinforcement not more than 16 inches (406.4 mm) o.c.
 3. Space reinforcement not more than 8 inches (203.2 mm) o.c. in foundation walls and parapet walls.
 4. Provide reinforcement not more than 8 inches (203.2 mm) above and below wall openings and extending 12 inches (304.8 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
1. Provide an open space not less than 1/2 inch (12.7 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 16 inches (406.4 mm) o.c. vertically and 24 inches (609.6 mm) o.c. horizontally.

3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
1. Install preformed control-joint gaskets designed to fit standard sash block.
- C. Form expansion joints in brick as follows:
1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch (9.52 mm) for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

- D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch (9.52 mm).
 - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry or precast U-lintels where indicated and where openings of more than 12 inches (304.8 mm) for brick-size units and 24 inches (609.6 mm) for block-size units are indicated without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches (203.2 mm) at each jamb unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, AND CAVITY 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. Install flashing as follows unless otherwise indicated:
 - 1. At masonry-veneer walls, extend flashing through veneer, across airspace and up face of CMU or sheathing at least 18 inches (457.2 mm). Fasten upper edge of flexible flashing to CMU or sheathing through termination bar.
 - 2. At lintels and shelf angles, extend flashing 6 inches (152.4 mm) minimum, to edge of next full unit at each end. At heads and sills, extend flashing 6 inches minimum, to edge of next full unit and terminate with premanufactured end dams.
 - 3. At inside and outside corners, terminate flashings with pre-manufactured soldered corners as specified.
 - 4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (12.7 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge. Metal drip edge shall be flush with outside face of veneer.
- C. Install reglets and nailers for flashing and other related construction where they are indicated to be built into masonry.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 - 1. Use specified weep products to form weep holes.
 - 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 - 3. Space weep holes formed from wicking material 16 inches (406.4 mm) o.c.
 - 4. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Accessories" Article.

3.13 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms 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 that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602.

- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 48 inches (1219.2 mm).

3.14 FIELD QUALITY CONTROL

- A. Testing Agency: Perform tests and inspections. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements will be at Contractor's expense.
- B. Inspections: Special inspections in accordance with Section 014000 "Quality Requirements."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.

3.15 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, where indicated.
- 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 Architect'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 or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 - 7. Clean masonry with a proprietary acidic masonry cleaner applied according to manufacturer's written instructions.

3.16 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042000