

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for construction of masonry unit walls.

1.2 RELATED WORK

- A. Mortars and grouts: Section 04 05 13, MASONRY MORTARING, Section 04 05 16, MASONRY GROUTING.
- B. Steel lintels and shelf angles: Section 05 50 00, METAL FABRICATIONS.
- C. Cavity insulation: Section 07 21 13, THERMAL INSULATION.
- D. Sealants and sealant installation: Section 07 92 00, JOINT SEALANTS.
- E. Color and texture of masonry units: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Samples:
 - 1. Ground Face Block, sample panel, 400 mm by 600 mm (16 inches by 24 inches,) showing full color range and texture of bricks, bond, and proposed mortar joints.
 - 2. Concrete masonry units, when exposed in finish work.
 - 3. Anchors, and ties, one each and joint reinforcing 1200 mm (48 inches) long.
- C. Shop Drawings:
 - 1. Special masonry shapes.
 - 2. Drawings, showing reinforcement, applicable dimensions and methods of hanging soffit or lintel masonry and reinforcing masonry for embedment of anchors for hung fixtures.
 - 3. Ground face block units for typical window and door openings, and, for special conditions as affected by structural conditions.
 - a. Drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar

schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement in wall at $1/4" = 1'-0"$ scale.

D. Certificates:

1. Certificates signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.
2. Indicating that the following items meet specification requirements:
 - a. Solid and load-bearing concrete masonry units, including fire-resistant rated units.
3. Testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.

E. Laboratory Test Reports:

1. Solid and load-bearing concrete masonry units, including fire-resistant rated units.
2. Ground Face Block

F. Manufacturer's Literature and Data:

1. Anchors, ties, and reinforcement.
2. Shear keys.
3. Reinforcing bars.

G. Material Data:

1. Each different cement product required for mortar and grout including name of manufacturer, brand, and type.
2. Each material and grade indicated for reinforcing bars.
3. Each type and size of joint reinforcement.
4. Each type and size of anchors, ties, and metal accessories.

H. Material Test Reports:

1. Mortars complying with property requirements of ASTM C 270.
2. Grout complying with ASTM C476; include description of type and proportions of grout ingredients.
3. Masonry units.

I. Construction Procedures: Submit cold-weather construction and hot weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.

1.4 SAMPLE PANEL

- A. Before starting masonry, lay up a sample panel in accordance with Masonry Standards Joint Committee (MSJC) and Brick Industry Association (BIA).
 - 1. Use masonry units from random cubes of units delivered on site.
 - 2. Include reinforcing, ties, and anchors.
- B. Use sample panels approved by COR for standard of workmanship of new masonry work.
- C. Use sample panel to test cleaning methods.

1.5 WARRANTY

Warrant exterior masonry walls against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be five years.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A951-06.....Steel Wire for Masonry Joint Reinforcement.
 - A615/A615M-07.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - A675/A675M-03.....Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties
 - C34-03 Structural Clay Load-Bearing Wall Tile
 - C55-06.....Concrete Building Brick
 - C56-05.....Structural Clay Non-Load-Bearing Tile
 - C62-05.....Building Brick (Solid Masonry Units Made From Clay or Shale)
 - C67-07.....Sampling and Testing Brick and Structural Clay Tile
 - C90-06.....Load-Bearing Concrete Masonry Units
 - C126-99.....Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
 - C216-07.....Facing Brick (Solid Masonry Units Made From Clay or Shale)

- C476-02.....Standard Specification for Grout for Masonry
- C612-04.....Mineral Fiber Block and Board Thermal Insulation
- C744-05.....Prefaced Concrete and Calcium Silicate Masonry
Units.
- D1056-07.....Flexible Cellular Materials - Sponge or Expanded
Rubber
- D2000-06.....Rubber Products in Automotive Applications
- D2240-05.....Rubber Property - Durometer Hardness
- D3574-05.....Flexible Cellular Materials-Slab, Bonded, and
Molded Urethane Foams
- F1667-05.....Fasteners: Nails, Spikes and Staples
- C. Masonry Industry Council:
All Weather Masonry Construction Manual, 2000.
- D. American Welding Society (AWS):
D1.4-05 Structural Welding Code - Reinforcing Steel.
- E. Federal Specifications (FS):
FF-S-107C-00.....Screws, Tapping and Drive
- F. Brick Industry Association - Technical Notes on Brick Construction
(BIA):
- 11-1986.....Guide Specifications for Brick Masonry, Part I
- 11A-1988.....Guide Specifications for Brick Masonry, Part II
- 11B-1988.....Guide Specifications for Brick Masonry, Part III
Execution
- 11C-1998.....Guide Specification for Brick Masonry Engineered
Brick Masonry, Part IV
- 11D-1988.....Guide Specifications for Brick Masonry
Engineered Brick Masonry, Part IV continued
- G. Masonry Standards Joint Committee; Specifications for Masonry Structures
(ACI 530.1-05/ASCE 6-05/TMS 602-99) (MSJC).

1.7 SPECIAL INSTRUCTIONS

- A. Refer to Specification Section 01 45 29 and the schedule of Special Inspections.

1.8 MATERIAL EVALUATION/ QUALITY CONTROL

- A. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings".

PART 2 - PRODUCTS**2.1 CONCRETE MASONRY UNITS**

- A. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.
 - 1. Unit Weight: Normal weight
 - 2. Fire rated units for fire rated partitions.
 - 3. Sizes: Modular.
 - 4. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.
 - 5. Use bullnose concrete masonry units at corners exposed in finished work with 25 mm (one inch) minimum radius rounded vertical exterior corners (bullnose units).
 - 6. Customized units:
 - a. Ground Face Units
 - 1. Integral water repellent admixture.
 - 7. Use two-cell units for reinforced masonry applications.
- B. Load-bearing masonry Concrete Units: ASTM C 90 and as follows:
 - 1. Unit Compressive Strength: Minimum average net area compressive strength of 2,800 psi.
 - 2. Weight Classification: Normal weight.

2.2 MORTAR AND GROUT MATERIALS:

- A. Portland Cement: ASTM C 150, Type I. Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce required mortar color.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate for Mortar: ASTM C 144. For joints less than 1/4 inch, use aggregate graded with 100 percent passing No. 16 sieve.
- H. Water: Clean and potable.
- I: Additives: Not permitted.

2.3 SHEAR KEYS

- A. ASTM D2000, solid extruded cross-shaped section of rubber, neoprene, or polyvinyl chloride, with a durometer hardness of approximately 80 when tested in accordance with ASTM D2240, and a minimum shear strength of 3.5 MPa (500 psi).
- B. Shear key dimensions: Approximately 70 mm by 8 mm for long flange and 38 mm by 16 mm for short flange (2-3/4 inches by 5/16 inch for long flange, and 1-1/2 inches by 5/8 inch for short flange).

2.4 REINFORCEMENT:

- A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.
- B. Steel Reinforcing Bars: Material and grade as follows:
 - 1. Billet steel complying with ASTM A 615
 - 2. Grade 60.

2.5 JOINT REINFORCEMENT

- A. General: Provide joint reinforcement complying with requirements of referenced unit masonry standard and this article, formed from the following:
 - 1. Galvanized carbon steel wire. Coating class as required by referenced unit masonry standard for application indicated.
- B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units and complying with requirements indicated below:
 - 1. Wire Diameter for Side Rods: 0.1483 inch (9 gauge).
 - 2. Wire Diameter for Cross Rods: 0.1483 inch (9 gauge).
 - 3. For single-wythe masonry, provide type as follows with single pair of side rods:
 - a. Ladder-type design with perpendicular cross spaced not more than 16 inches on center with one side rod in each face shell.

2.6 ANCHORS, TIES, AND REINFORCEMENT

- A. Steel Reinforcing Bars: ASTM A615M, deformed bars, grade as shown.
- B. Adjustable Veneer Anchor for Frame Walls:
 - 1. Two piece, adjustable anchor and tie.
 - 2. Anchor & Pintle Type:

- a. Anchor: Screw-on galvanized steel anchor strap 12 gauge backplate of adequate depth to accommodate insulation thickness. Provide two holes for fasteners.
 - b. Pintle: 'O' Shaped, fabricated of 5 mm (3/16 inch) diameter galvanized cold drawn steel wire. Ties long enough to engage the anchor and be embedded not less than 50 mm (2 inches) into the bed joint of the masonry veneer and allow for maximum 1-1/4 inches of vertical adjustment.
3. Dual-Barrel Screw Type:
- a. Fabricated from carbon steel with a premium quality organic polymer coating, the dual-diameter barrel has an integrated #12 self-drilling screw with factory installed EPDM washers to seal both the face of the insulation and the air/vapor barrier and is available for insulation from 5/8" - 4" thick. The projecting eyelet to accept a 3/16" wire tie.
- C. Dovetail Slots: Furnish dovetail slots with filler strips of slot size indicated, fabricated from 0.0336-inch (22-gauge) sheet metal.

2.7 PREFORMED COMPRESSIBLE JOINT FILLER

- A. Thickness and depth to fill the joint as specified.
- B. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1, B2F1.
- C. Non-Combustible Type: ASTM C612, Class 5, 1800 degrees F.

2.8 ACCESSORIES

- A. Weep Hole: Plastic, 10 mm (3/8 inch) X 38 mm (1 1/2") high x 90 mm (3 1/2" inch) long with stainless steel screws.
- B. Masonry Cleaner:
 - 1. Detergent type cleaner selected for each type masonry used.
 - 2. Acid cleaners are not acceptable.
 - 3. Use soapless type specially prepared for cleaning brick or concrete masonry as appropriate.
- C. Fasteners:
 - 1. Concrete Nails: ASTM F1667, Type I, Style 11, 19 mm (3/4 inch) minimum length.
 - 2. Masonry Nails: ASTM F1667, Type I, Style 17, 19 mm (3/4 inch) minimum length.
 - 3. Screws: FS-FF-S-107, Type A, AB, SF thread forming or cutting.

D. Rebar Positioners: Steel wire positioners that are seated into the cores of masonry units.

1. Wire Diameter: 0.1483 inch (9 gauge)
2. Mill galvanized finish for interior walls.
3. Acceptable products:
 - a. Corelock, by Wire-Bond.
 - b. DA810, by Dur-O-Wal/Dayton Superior.
 - c. No. 377 Center Cage Vertical Rod Positioner, by Heckmann Building Products.
 - d. Other products which are accepted as equivalent.

2.9 EMBEDDED FLASHING MATERIALS

A. Laminated Flashing: Manufacturer's standard laminated flashing of type indicated below:

1. Copper-fabric Laminate: Copper sheet of 3 oz. A square foot indicated below, bonded between two layers of glass-fiber cloth or flashing/drainage composite with the copper bonded between a glass-fiber cloth backing and a non-woven wicking fabric face.
2. Application: Use where flashing is fully concealed in masonry and as noted on drawings.
3. Subject to compliance with requirements, products that may be incorporated in the work include the following:
 - a. "Copper Fabric" by Afco Products Inc.
 - b. "Type FCC-Fabric Covered Copper" by Phoenix Building Products.
 - c. "Copper Fabric Flashing" by Sandell Manufacturing Co.
 - d. "Multi-Flash 500 Series" or "Flash-Vent" by York Manufacturing, Inc.
4. Where flashing is not embedded into interior wythe, provide termination bar and sealant at top of flashing on exterior face of interior wythe.
 - a. Provide stainless steel termination bar with anchor holes at 8 inches on center for flashing coated with asphalt.
 - b. Provide high-strength extruded polypropylene termination bar anchored at 8 inches on center for flashing not coated with asphalt.

B. Membrane Flashing:

1. Self-adhered, non-drooling membrane flashing, elastomeric lap

sealant, and stainless steel termination bar with anchor holes at 8 inches on center.

2. Application: Use where flashing is fully concealed in masonry and as noted on drawings.
3. Subject to compliance with requirements, products that may be incorporated in the work include the following:
 - a. "Perm-A-Barrier Wall Flashing" by Grace Construction Products.
 - b. "DA 1544 Flashing" and "DA 1510 Termination Bar" by Dur-O-Wal, Inc.
 - c. "Textroflash" with mastic and primer and "T1 Termination Bar" by Hohmann & Barnard, Inc.
 - d. "Sando-Seal" with termination bar by Sandell Manufacturing Co.
 - e. "Self Adhered (S/A) with Drip Membrane" by Hyload Cloaked Flashing System.

C. Adhesive/Sealant for Flashings: Type as recommended by manufacturer of flashing material for use indicated.

D. Drip Edge:

1. 3/8-inch exposed hemmed edge by 2-inch stainless steel drip edge. Select product compatible with flashing.
2. Subject to compliance with requirements, products that may be incorporated in the work include the following:
 - a. "DA 1525 Drip Edge Flashing" by Dur-O-Wal, Inc.
 - b. "DP" by Hohmann & Barnard, Inc.
 - c. "Drip Edge" by Johnson Bros.
3. Drip edge must be adhered to flashing with manufacturer's approved adhesive.
4. Isolate drip edge from metals other than stainless steel to avoid contact with drip edge.

E. Preformed Flashing:

1. Inside corners, outside corners, end dams, and jambs are to be preformed and compatible with flashing and drip edge.

2.12 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring 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.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification for Job-mixed Mortar and ASTM C 1142 for ready-mixed mortar of types indicated below:

1. Limit cementitious materials in mortar to portland cement-lime.
2. Use Type S mortar in the following locations:
 - a. Walls which are below grade and in contact with earth.
 - b. Load-bearing walls.
 - c. Exterior above-grade nonload-bearing walls and parapets.
 - d. Areas where another type of mortar is not indicated.
3. Use Type N mortar in the following locations:
 - a. Interior nonload-bearing partitions.
 - b. Veneers.
4. Provide entrained air content of 10 to 12 percent.

C. Colored Mortar: Select pre-blended ingredients to produce color required.

D. Colored Aggregate Mortar: Produce mortar of color required by use of colored aggregates in combination with selected cementitious materials.

1. Mix to match Architect's sample.

E. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.

F. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Protection:

1. Cover tops of walls with nonstaining waterproof covering, when work is not in progress. Secure to prevent wind blow off.
2. On new work protect base of wall from mud, dirt, mortar droppings, and other materials that will stain face, until final landscaping or other site work is completed.

B. Cold Weather Construction: See drawings for cold-weather construction requirements. In addition, comply with the following:

1. Do not lay masonry units that are wet or frozen.
2. Remove masonry damaged by freezing conditions.

C. Hot-Weather Construction: See drawings for hot-weather construction requirements.

3.2 CONSTRUCTION TOLERANCES

- A. Lay masonry units plumb, level and true to line within the tolerances as per MSJC requirements and as follows:
- B. Maximum variation from plumb:
 - 1. In 3000 mm (10 feet) - 6 mm (1/4 inch).
 - 2. In 6000 mm (20 feet) - 10 mm (3/8 inch).
 - 3. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).
- C. Maximum variation from level:
 - 1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 inch).
 - 2. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).
- D. Maximum variation from linear building lines:
 - 1. In any bay or up to 6000 mm (20 feet) - 13 mm (1/2 inch).
 - 2. In 12 000 mm (40 feet) or more - 19 mm (3/4 inch).
- E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
 - 1. Minus 6 mm (1/4 inch).
 - 2. Plus 13 mm (1/2 inch).
- F. Maximum variation in prepared opening dimensions:
 - 1. Accurate to minus 0 mm (0 inch).
 - 2. Plus 6 mm (1/4 inch).

3.3 INSTALLATION GENERAL

- A. Keep finish work free from mortar smears or spatters, and leave neat and clean.
- B. Anchor masonry as specified in Paragraph, ANCHORAGE.
- C. Wall Openings:
 - 1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
 - 2. If items are not available when walls are built, prepare openings for subsequent installation.
- D. Tooling Joints:
 - 1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
 - 2. Tool while mortar is soft enough to be compressed into joints and not raked out.
 - 3. Finish joints in exterior face masonry work with a jointing tool, and provide smooth, water-tight concave joint unless specified otherwise.

4. Tool Exposed interior joints in finish work concave unless specified otherwise.

E. Partition Height:

1. Extend following partitions to overhead construction where noted on drawings and as follows:
 - a. Where noted smoke partitions, FHP (full height partition), and FP (fire partition) and smoke partitions (SP) on drawings.
 - b. Both walls at expansion joints.
 - c. Corridor walls.
 - d. Walls at stairway and stair halls, elevators, dumbwaiters, and other vertical shafts.
 - e. Reinforced masonry partitions

F. Lintels:

1. Use steel lintels, for openings unless shown otherwise.
2. Doors having overhead concealed door closers require a steel lintel, and a pocket for closer box.
3. Length for minimum bearing of 200 mm (8 inches) at ends.

G. Wall, Furring, and Partition Units:

1. Lay out field units to provide for running bond of walls and partitions, with vertical joints in second course centering on first course units unless specified otherwise.
2. Align head joints of alternate vertical courses.
3. At sides of openings, balance head joints in each course on vertical center lines of openings.
4. Use no piece shorter than 100 mm (4 inches) long.
5. On interior partitions provide a 6 mm (1/4 inch) open joint for caulking between and abutting masonry partitions.
6. Use not less than 100 mm (4 inches) nominal thick masonry for free standing furring unless shown otherwise.
7. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.

H. Before connecting new masonry with previously laid, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.

I. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.

J. Chases:

1. Do not install chases in masonry walls and partitions exposed to view in finished work, including painted or coated finishes on masonry.
2. Masonry 100 mm (4 inch) nominal thick may have electrical conduits 25 mm (1 inch) or less in diameter when covered with soaps, or other finishes.
3. Full recess chases after installation of conduit, with mortar and finish flush.
4. When pipes or conduits, or both occur in hollow masonry unit partitions retain at least one web of the hollow masonry units.

K. Wetting and Wetting Test:

1. Do not wet concrete masonry units before laying.

L. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.

M. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.

3.4 ANCHORAGE

A. Veneer to Frame Walls:

1. Use adjustable veneer anchors.
2. Fasten anchor to stud through sheathing with self drilling and tapping screw, one at each end of loop type anchor.
3. Space anchors not more than 400 mm (16 inches) on center vertically at each stud.

B. Anchorage of Abutting Masonry:

1. Anchor abutting interior masonry partitions to concrete and masonry construction, with adjustable wall ties. Extend ties at least 100 mm (4 inches) into joints of new masonry. Fastened to existing concrete and masonry construction, with powder actuated drive pins, nail or other means that provides rigid anchorage. Install anchors at 400 mm (16 inch) maximum vertical intervals.

3.5 REINFORCEMENT

A. Joint Reinforcement:

1. General: Provide continuous horizontal joint reinforcement as indicated.
Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls; 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.
2. Install single-wythe horizontal joint reinforcing in concrete masonry veneer at 16 inches on center vertically, unless noted otherwise.
3. Cut or interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
4. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, pipe enclosures, and other special conditions.

B. Steel Reinforcing Bars:

1. Install in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for lintels and bond beam horizontal reinforcement. Install in wall cavities of reinforced masonry walls where shown.
2. Use grade 60 bars if not specified otherwise.
3. Bond Beams:
 - a. Form Bond beams of load-bearing concrete masonry units filled with ASTM C476 grout and reinforced with 2-#15m (#5) reinforcing steel unless shown otherwise. Do not cut reinforcement.
 - b. Brake bond beams only at expansion joints and at control joints, if shown.

3.6 CMU CONTROL JOINTS.

- A. Provide CMU control (CJ) joints where shown on drawings.
- B. Keep joint free of mortar and other debris.
- C. Where joints occur in masonry walls.
 1. Install cross shaped shear keys in concrete masonry unit wythe with preformed compressible joint filler on each side of shear key unless otherwise specified.
 2. Install filler, backer rod, and sealant on exposed faces.

- D. Use standard notched concrete masonry units (sash blocks) made in full and half-length units where shear keys are used to create a continuous vertical joint.
- E. Interrupt steel joint reinforcement at expansion and control joints unless otherwise shown.
- F. Fill opening in exposed face of expansion and control joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.7 BUILDING EXPANSION AND SEISMIC JOINTS

- A. Keep joint free of mortar. Remove mortar and other debris.
- B. Install non-combustible, compressible type joint filler to fill space completely except where sealant is shown on joints in exposed finish work.
- C. Where joints are on exposed faces, provide depth for backer rod and sealant as specified in Section 07 92 00, JOINT SEALANTS, unless shown otherwise.

3.8 ISOLATION SEAL

- A. Where full height walls or partitions lie parallel or perpendicular to and under structural beams or shelf angles, provide a separation between walls or partitions and bottom of beams or shelf angles not less than the masonry joint thickness unless shown otherwise.
- B. Insert in the separation, a continuous full width strip of non-combustible type compressible joint filler.
- C. Where exposed in finish work, cut back filler material in the joint enough to allow for the joint to be filled with sealant material specified in Section 07 92 00, JOINT SEALANTS.

3.9 CONCRETE MASONRY UNITS

- A. Kind and Users:
 - 1. Provide special concrete masonry shapes as required, including lintel and bond beam units, sash units, and corner units. Use solid concrete masonry units, where full units cannot be used, or where needed for anchorage of accessories.
 - 2. Provide solid load-bearing concrete masonry units or grout the cell of hollow units at jambs of openings in walls, where structural members impose loads directly on concrete masonry, and where shown.
 - 3. Provide rounded corner (bullnose) shapes at opening jambs in exposed work and at exterior corners.

4. Masonry assemblies shall meet the required fire resistance in fire rated partitions of type and construction that will provide fire rating as shown.

B. Laying:

1. Lay concrete masonry units with 10 mm (3/8 inch) joints, with a bond overlap of not less than 1/4 of the unit length, except where stack bond is required.
2. Do not wet concrete masonry units before laying.
3. Bond external corners of partitions by overlapping alternate courses.
4. Lay first course in a full mortar bed.
5. Set anchorage items as work progress.
6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill such voids with mortar or grout.
7. Provide a 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, concrete work, and abutting masonry partitions.
8. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
9. Lay concrete masonry units so that cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar. Unobstructed core openings not less than 50 mm (2 inches) by 75 mm (3 inches).
10. Do not wedge the masonry against the steel reinforcing. Minimum 13 mm (1/2 inch) clear distance between reinforcing and masonry units.
11. Install deformed reinforcing bars of sizes shown.
12. Steel reinforcement, at time of placement, free of loose flaky rust, mud, oil, or other coatings that will destroy or reduce bond.
13. Steel reinforcement in place before grouting.
14. Minimum clear distance between parallel bars: One bar diameter.
15. Hold vertical steel reinforcement in place by centering clips, caging devices, tie wire, or other approved methods, vertically at spacings noted.
16. Support vertical bars near each end and at intermediate intervals not exceeding 192 bar diameters.
17. Reinforcement shall be fully encased by grout or concrete.

18. Splice reinforcement or attach reinforcement to dowels by placing in contact and secured or by placing the reinforcement within $1/5$ of the required bar splice length.
19. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
20. Grout cells of concrete masonry units, containing the reinforcing bars, solid as specified under grouting.
21. Cavity and joint horizontal reinforcement may be placed as the masonry work progresses.

3.10 POINTING

- A. Fill joints with pointing mortar using rubber float trowel to rub mortar solidly into raked joints.
- B. Wipe off excess mortar from joints of glazed masonry units with dry cloth.
- C. Finish exposed joints in finish work with a jointing tool to provide a smooth concave joint unless specified otherwise.

3.11 GROUTING

- A. Preparation:
 1. Clean grout space of mortar droppings before placing grout.
 2. Close cleanouts.
 3. Install vertical solid masonry dams across grout space for full height of wall at intervals of not more than 9000 mm (30 feet). Do not bond dam units into wythes as masonry headers.
 4. Verify reinforcing bars are in cells of units or between wythes as shown.
- B. Placing:
 1. Place grout by hand bucket, concrete hopper, or grout pump.
 2. Consolidate each lift of grout after free water has disappeared but before plasticity is lost.
 3. Do not slush with mortar or use mortar with grout.
 4. Interruptions:
 - a. When grouting must be stopped for more than an hour, top off grout 50 mm (2 inch) below top of last masonry course.
 - b. Grout from dam to dam on high lift method.

- c. A longitudinal run of masonry may be stopped off only by raking back one-half a masonry unit length in each course and stopping grout 100 mm (4 inches) back of rake on low lift method.

C. Low Lift Method:

1. Construct masonry to a height of 1.5 m (5 ft) maximum before grouting.
2. Grout in one continuous operation and consolidate grout by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.

D. High Lift Method:

1. Do not pour grout until masonry wall has properly cured a minimum of 4 hours.
2. Place grout in lifts not exceeding 1.5 m (5 ft).
3. When vibrating succeeding lifts, extend vibrator 300 to 450 mm (12 to 18 inches) into the preceding lift to close any shrinkage cracks or separation from the masonry units.

3.12 PLACING REINFORCEMENT

- A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on the Contract Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.
- B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 25 mm (1 inch), whichever is greater.
- C. Splice reinforcement bars where shown; do not splice at other places unless accepted by the COR. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
- D. Provide not less than minimum lap as indicated on shop drawings, or if not indicated, as required by governing code.
- E. Weld splices where indicated. Comply with the requirements of AWS D1.4 for welding materials and procedures.

- F. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations.
- G. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations. Lap joint reinforcement not less than 150 mm (6 inches) at ends. Use prefabricated "L" and "T" sections to provide continuity at corners and intersections. Cut and bend joint reinforcement as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- H. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.
- I. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

3.13 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. For starting course on foundations, provide full mortar coverage on horizontal and vertical face shells and webs.
 - 3. Bed webs in mortar at grouted cells.
- B. Cut joints flush for masonry walls to be concealed or covered by other materials unless otherwise indicated.

3.14 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls; 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.
- B. Install single-wythe horizontal joint reinforcing in concrete masonry veneer at 16 inches on center vertically, unless noted otherwise.
- C. Cut or interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, pipe enclosures, and other special conditions.

- E. Do not wet concrete masonry units (CMU).
- F. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 10 mm (3/8 inch) joints.
- G. Where solid CMU units are shown, lay with full mortar head and bed joints.
- H. Walls:
 - 1. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jams, sash, control joints, lintels, bond beams and other special conditions.
 - 2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
 - 3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.
- I. Grouting:
 - 1. Use "Fine Grout" per ASTM C476 for filling spaces less than 100 mm (4 inches) in one or both horizontal directions.
 - 2. Use "Coarse Grout" per ASTM C476 for filling 100 mm (4 inch) spaces or larger in both horizontal directions.
 - 3. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements which follow.
- J. Low-Lift Grouting:

1. Provide minimum clear dimension of 50 mm (2 inches) and clear area of 5160 mm² (8 square inches) in vertical cores to be grouted.
2. Place vertical reinforcement prior to grouting of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 3 m (10 feet).
3. Lay CMU to maximum pour height. Do not exceed 1.5 m (5 foot) height, or if bond beam occurs below 1.5 m (5 foot) height, stop pour 50 mm (2 in) below top of bond beam.
4. Pour grout using chute container with spout or pump hose. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 50 mm (2 inches) below top course of pour.
5. Bond Beams: Stop grout in vertical cells 50 mm (2 inches) below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

K. High-Lift Grouting:

1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 75 mm (3 inches) and 6450 mm² (10 square inches), respectively.
2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout.
3. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.
4. Construct masonry to full height of maximum grout pour specified, prior to placing grout.
5. Limit grout lifts to a maximum height of 1.5 m (5 feet) and grout pour to a maximum height of 7.3 m (24 feet), for single wythe hollow concrete masonry walls, unless otherwise indicated.
6. Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 3 m (10 feet).

7. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosed before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends.
8. Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing indicated.
9. Place horizontal beam reinforcement as the masonry units are laid.
10. Embed lateral tie reinforcement in mortar joints where indicated. Place as masonry units are laid, at vertical spacing shown.
11. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.
12. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.
13. Place grout by pumping into grout spaces unless alternate methods are acceptable to the COR.
14. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 1.5 m (5 feet). Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Mechanically consolidate each grout lift during pouring operation.
15. Place grout in lintels or beams over openings in one continuous pour.
16. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 25 mm (1 inch) of vertically reinforced cavities, during construction of masonry.
17. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 50 mm (2 inches) of top course of

first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

3.15 CLEANING AND REPAIR

A. General:

1. Clean exposed masonry surfaces on completion.
2. Protect adjoining construction materials and landscaping during cleaning operations.
3. Cut out defective exposed new joints to depth of approximately 19 mm (3/4 inch) and repoint.
4. Remove mortar droppings and other foreign substances from wall surfaces.

B. Concrete Masonry Units:

1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
2. Allow mud to dry before brushing.

D. Ground Face Block:

1. Clean as recommended by tile or brick manufacturer. Protect light colored mortar joints from discoloration during cleaning.
2. Prepare schedule of test locations.

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