

**SECTION 04 20 00****UNIT MASONRY****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies requirements for construction of masonry unit walls.

**1.2 RELATED WORK**

- A. Mortars: Section 04 05 13, MASONRY MORTARING.
- B. Steel lintels: Section 05 50 00, METAL FABRICATIONS.
- C. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.
- 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. Face brick, sample panel, 200 mm by 400 mm (8 inches by 16 inches,) showing full color range and texture of bricks, bond, and proposed mortar joints.
    - a. Samples of custom shapes for molded or profile brick to match existing units.
  2. 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. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcing bars. Comply with ACI 315. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.
- 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. Face brick.
  - b. Solid and load-bearing concrete masonry units.
3. Testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.

E. Manufacturer's Literature and Data:

1. Anchors, ties, and reinforcement.
2. Reinforcing bars.

1.4 SAMPLE PANEL

- A. Before starting masonry, provide a sample installation panel in accordance with Masonry Standards Joint Committee (MSJC) and Brick Industry Association (BIA) where indicated on the drawings.
  1. Use approved masonry replacement units.
  2. Include reinforcing, ties, and anchors.
  3. Bond and mortar joints to match existing.
- B. Use sample installation panels approved by VA for standard of workmanship of new masonry work.
- C. Use sample panel to test cleaning methods.

1.5 WARRANTY

- A. 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):
  1. A951-06 Steel Wire for Masonry Joint Reinforcement.
  2. C55-06 Concrete Building Brick
  3. C62-05 Building Brick (Solid Masonry Units Made From Clay or Shale)
  4. C67-07 Sampling and Testing Brick and Structural Clay Tile
  5. C90-06 C216-07 Facing Brick (Solid Masonry Units Made From Clay or Shale)

6. C612D1056-07 Flexible Cellular Materials - Sponge or Expanded Rubber
  7. D3574-05 Flexible Cellular Materials-Slab, Bonded, and Molded Urethane Foams
  8. F1667-05 Fasteners: Nails, Spikes and Staples
- C. Masonry Industry Council:
1. All Weather Masonry Construction Manual, 2000.
- D. Federal Specifications (FS):
1. FF-S-107C-00 Screws, Tapping and Drive
- E. Brick Industry Association - Technical Notes on Brick Construction (BIA):
1. 11-1986 Guide Specifications for Brick Masonry, Part I
  2. 11A-1988 Guide Specifications for Brick Masonry, Part II
  3. 11B-1988 Guide Specifications for Brick Masonry, Part III Execution
- F. Masonry Standards Joint Committee; Specifications for Masonry Structures (ACI 530.1-05/ASCE 6-05/TMS 602-99) (MSJC).

## **PART 2 - PRODUCTS**

### **2.1 BRICK**

- A. Face Brick:
1. New brick shall be hand formed in a wood mold.
  2. ASTM C216, Grade SW, Type FBS.
  3. Brick when tested in accordance with ASTM C67: Classified slightly efflorescent or better.
  4. Size:
    - a. Modular
    - b. Size and profiles to match existing.
- B. Building Brick: ASTM C62, Grade MW for backup and interior work; Grade SW where in contact with earth.

### **2.2 CONCRETE MASONRY UNITS**

- A. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.
1. Unit Weight: Normal weight.
  2. Sizes: Modular.
- B. Concrete Brick: ASTM C55.

### 2.3 ANCHORS, TIES, AND REINFORCEMENT

- A. Steel Reinforcing Bars: ASTM A615, deformed bars, 420 MPa (Grade 60) for bars No. 10 to No. 57 (No. 3 to No. 18), except as otherwise indicated.
- B. Shop-fabricate reinforcement bars which are shown to be bent or hooked.
- C. Joint Reinforcement:
  - 1. Form from wire complying with ASTM A951.
  - 2. Galvanized after fabrication.
  - 3. Width of joint reinforcement 40 mm (0.16 inches) less than nominal width of masonry wall or partition.
  - 4. Cross wires welded to longitudinal wires.
  - 5. Joint reinforcement at least 3000 mm (10 feet) in length.
  - 6. Joint reinforcement in rolls is not acceptable.
  - 7. Joint reinforcement that is crimped to form drip is not acceptable.
  - 8. Maximum spacing of cross wires 400 mm (16 inch) to longitudinal wires.
  - 9. Ladder Design:
    - a. Longitudinal wires deformed 4 mm (0.16 inch) diameter wire.
    - b. Cross wires 4 mm (0.16 inch) diameter.
  - 10. Multiple Wythes and Cavity wall ties:
    - a. Longitudinal wires 4 mm (0.16 inch), two in each wythe with ladder truss wires 4 mm (0.16 inch) overlay, welded to each longitudinal wire.
    - b. Longitudinal wires 4 mm (0.16 inch) with U shape 4 mm (0.16 inch) rectangular ties extending into other wythe not less than 75 mm (3 inches) spaced 400 mm o.c. (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches min.).
- D. Individual ties:
  - 1. Rectangular ties: Form from 5 mm (3/16 inch) diameter galvanized steel rod to a rectangular shape not less than 50 mm (2 inches) wide by sufficient length for ends of ties to extend within 25 mm (1 inch) of each face of wall. Ties that are crimped to form drip are not permitted.
  - 2. Adjustable Cavity Wall Ties:
    - a. Adjustable wall ties may be used at Contractor's option.
    - b. Two piece type permitting up to 40 mm (1-1/2 inch) adjustment.
    - c. Form ties from 5 mm (3/16 inch) diameter galvanized steel wire.
    - d. Form one piece to a rectangular shape 105 mm (4-1/8 inches) wide by length required to extend into the bed joint 50 mm (2 inches).
    - e. Form the other piece to a 75 mm (3 inch) long by 75 mm (3 inch) wide shape, having a 75 mm (3 inch) long bent section for engaging the 105 mm (4-1/8 inch) wide piece to form adjustable connection.

## 2.4 ACCESSORIES

### A. Box Board:

1. Mineral Fiber Board: ASTM C612, Class 1.
2. 25 mm (1 inch) thickness.
3. Other spacing material having similar characteristics may be used subject to the VA's approval.

### 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.

## 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 Protection:

1. Masonry may be laid in freezing weather when methods of protection are utilized.
2. Comply with MSJC and "Hot and Cold Weather Masonry Construction Manual".

### 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. 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 all joints exposed to view to match existing.
5. Tool Exposed interior joints in finish work concave unless specified otherwise.

E. Lintels:

1. Lintels are not required for openings less than 1000 mm (3 feet 4 inches) wide that have hollow metal frames.
2. Use steel lintels, for openings over 1600 mm (5 feet 4 inches) wide, brick masonry unless shown otherwise.

3. Length for minimum bearing of 100 mm (4 inches) at ends.
4. Build masonry openings or arches over wood or metal centering and supports when steel lintels are not used.
5. All exterior lintels shall be galvanized.

F. Wall Units:

1. Lay out field units to match existing bond of walls
2. At sides of openings, balance head joints in each course on vertical center lines of openings.
3. Use no piece shorter than 100 mm (4 inches) long.

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

H. Wetting and Wetting Test:

1. Test and wet brick or clay tile in accordance with BIA 11B.
2. Do not wet concrete masonry units before laying.

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

- J. Construct formwork to conform to shape, line and dimensions shown. Brace, tie and support as required to maintain position and shape during construction and curing of reinforced masonry.

- K. 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. Masonry Facing to Backup:

1. Use individual ties for new work.
2. Stagger ties in alternate courses, and space at 400 mm (16 inches) maximum vertically, and 600 mm (2 feet) horizontally.
3. At openings, provide additional ties spaced not more than 900 mm (3 feet) apart vertically around perimeter of opening, and within 300 mm (12 inches) from edge of opening.
4. Anchor new masonry facing to existing masonry with corrugated wall ties spaced at 400 mm (16 inch) maximum vertical intervals and at every second masonry unit horizontally. Fasten ties to masonry with masonry nails.
5. Option: Use joint reinforcing for multiple wythes and cavity wall ties spaced not more than 400 mm (16 inches) vertically.
6. Tie interior and exterior wythes of reinforced masonry walls together with individual ties. Provide ties at intervals not to exceed 600 mm (24 inches) on center horizontally, and 400 mm (16 inches) on center vertically. Lay ties in the same line vertically in order to

facilitate vibrating of the grout pours.

### 3.5 REINFORCEMENT

#### A. Joint Reinforcement:

1. Use as joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
2. Reinforcing may be used in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.
3. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
4. Additional joint reinforcement is required in mortar joints at both 200 mm (8 inches) and 400 (16 inches) above and below windows, doors, louvers and similar openings in masonry, except where other type anchors are required for anchorage of masonry to concrete structure.
  - a. Brake bond beams only at expansion joints and at control joints, if shown.
  - b. Locate additional joint reinforcement in vertical and horizontal joints as shown.

### 3.6 BRICKWORK

#### A. Lay clay brick in accordance with BIA Technical Note 11 series.

#### B. Laying:

1. Lay brick in running bond with course of masonry bonded at corners unless shown otherwise. Match bond of existing building on alterations and additions.
2. Maintain bond pattern throughout.
3. Do not use brick smaller than half-brick at any angle, corner, break or jamb.
4. Where length of cut brick is greater than one half but less than a whole brick, maintain the vertical joint location of such units.
5. Lay exposed brickwork joints symmetrical about center lines of openings.
6. Do not structural bond multi wythe brick walls unless shown.
7. Before starting work, lay facing brick on foundation wall and adjust bond to openings, angles, and corners.
8. Build solid brickwork as required for anchorage of items.

#### C. Joints:

1. Exterior and interior joint widths: Lay for three equal joints in 200 mm (8 inches) vertically, unless shown otherwise.
2. Rake joints for pointing with colored mortar when colored mortar is not full depth.
3. Arches:



- a. Flat arches (jack arches) lay with camber of 1 in 200 (1/16 inch per foot) of span.
  - b. Face radial arches with radial brick with center line of joints on radial lines.
  - c. Form Radial joints of equal width.
- D. Solid Exterior Walls:
1. Build with 100 mm (4 inches) of nominal thick facing brick, backed up with 100 mm (4 inches) nominal thick face brick.
  2. Construct solid brick jambs not less than 20 mm (0.8 inches) wide at exterior wall openings and at recesses. except where exposed concrete unit backup is shown.
  3. Do not use full bonding headers.
  4. Parging:
    - a. For solid masonry walls, lay backup to height of six brick courses, parge backup with 13 mm (1/2 inch) of mortar troweled smooth; then lay exterior wythe to height of backup.
    - b. Make parging continuous over backup, and extend 150 mm (6 inches) onto adjacent concrete or masonry.
    - c. Parge, with mortar, the ends and backs for recesses in exterior walls to a thickness of 13 mm (1/2 inch).
    - d. Parge with mortar to true even surface the inside surface of exterior walls to receive insulation.

### 3.7 CONCRETE MASONRY UNITS

#### A. Kind and Uses:

1. 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.
3. Use concrete building brick only as filler in backup material where not exposed and as approved by VA.

#### 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. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.

8. Steel reinforcement, at time of placement, free of loose flaky rust, mud, oil, or other coatings that will destroy or reduce bond.
9. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
10. Cavity and joint horizontal reinforcement may be placed as the masonry work progresses.

### 3.8 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. Horizontal reinforcement may be placed as the masonry work progresses.
- C. Provide not less than minimum lap as indicated on shop drawings, or if not indicated, as required by governing code.
- D. 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.
- E. 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, pipe enclosures and other special conditions.
- F. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

### 3.9 INSTALLATION OF BRICK MASONRY

- A. Mortar Jointing and Bedding:
  1. Pattern Bond: Lay wythes in the pattern bond to match existing work. Lay inner wythes (if any) with all units in a wythe bonded by lapping not less than 50 mm (2 inches). Bond and interlock each course of each wythe at corners and intersections. Do not use units with less than 100 mm (4 inch) nominal horizontal face dimension at corners or jambs.
    - a. Tooth in all new/replacement work to match existing.
  2. Lay exterior wythes with bed (horizontal) and head (vertical) joints between units completely filled with mortar. Top of bed joint mortar may be sloped toward center of walls. Butter ends of units with sufficient mortar to completely fill head joints and shove into place. Do not furrow bed joints or slush head joints. Remove any mortar fins which protrude into grout space.

3. Maintain joint widths shown for head and bed joints, except for minor variations required to maintain pattern bond. If not shown, lay with 10 mm (3/8 inch) head and bed joints.
  4. Match existing joint widths.
- B. Two-Wythe Wall Construction: Lay both wythes as previously specified for exterior wythes.
- 3.10 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. Brickwork:
1. First wet surfaces with clean water, then wash down with a solution of soapless detergent. Do not use muriatic acid.
  2. Brush with stiff fiber brushes while washing, and immediately thereafter hose down with clean water.
  3. Free clean surfaces of traces of detergent, foreign streaks, or stains of any nature.
- C. Concrete Masonry Units:
1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
  2. Allow mud to dry before brushing.
- 3.11 WATER PENETRATION TESTING
- A. Seven days before plastering or painting, in the presence of VA, test solid exterior masonry walls for water penetration.
- B. Direct water on masonry for a period of one hour at a time when wind velocity is less than five miles per hour.
- C. Should moisture appear on inside of walls tested, make additional tests at other areas as directed by VA.
- Correct the areas showing moisture on inside of walls, and repeat test at repaired areas, to insure that moisture penetration has been stopped.

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