SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 DESIGN CRITERIA

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete Masonry Units
2. Decorative concrete masonry units
3. Brick veneer
4. Mortar and grout.
5. Reinforcing steel.
7. Ties and Anchors
8. Miscellaneous masonry accessories.
10. Through Wall Flashing

1.3 PERFORMANCE REQUIREMENTS

A. Determine compressive strength of masonry from net-area compressive strengths of masonry units and mortar types according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.4 SUBMITTALS

A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

B. Shop Drawings: Show fabrication and installation details for the following:
   1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
   2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: For the following:
   1. Unit masonry Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
   2. Colored mortar Samples showing the full range of colors available.

D. Samples for Verification: For the following:
   1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project.

3. Weep holes/vents in color to match mortar color.

4. Accessories embedded in the masonry.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

F. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:

1. Each type of masonry unit required.
   a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
   b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.

2. Mortar complying with property requirements of ASTM C270.
3. Grout mixes complying with compressive strength requirements of ASTM C 476.
4. Include description of type and proportions of grout ingredients.

G. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Each type of masonry unit required.
   a. Include size-variation data for brick and CMU, verifying that actual range of sizes falls within specified tolerances.
   b. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.

2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
4. Each material and grade indicated for reinforcing bars.
5. Each type and size of joint reinforcement.
6. Each type and size of anchor, tie, and metal accessory.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

E. Mockups: Before installing unit masonry, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed work. Requirement for the mockup may be waived by WSU Project Manager.

1. Locate mockups in the locations indicated or, if not indicated, as directed by WSU Project Manager.
2. Build mockup of typical wall areas for interior wainscot, exterior wall and all products as shown on Drawings.
3. Build mockups for the following types of masonry in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness, including face and backup wythes and accessories. Include a sealant-filled joint at least 16 inches (400 mm) long in each mockup.
   a. Typical exterior wall with corner of window opening in mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
   b. Typical exterior wall with through-wall flashing installed for a 24-inch (600-mm) length in corner of mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit masonry above half of flashing).

4. Clean exposed faces of mockups with masonry cleaner as indicated.
5. Notify WSU Project Manager seven days in advance of dates and times when mockups will be constructed.
6. Protect accepted mockups from the elements with weather-resistant membrane.
7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
8. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

   a. Approval of mockups is also for other material and construction qualities specifically approved by WSU Project Manager in writing.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by WSU Project Manager in writing.

9. Demolish and remove mockups when directed.

F. Masonry cleaning Mock-ups: Cleaning mock-ups will not be permitted on the structure. In addition to the mock-ups that establish a level of quality, a series of masonry mock-up panels that reflect masonry work in progress and establish cleaning procedures and acceptable end results are to be constructed during the course of the masonry work and prior to commencement of cleaning operations. This requirement may be waived by WSU Project Manager.

1. Number of mock-ups required for each color and texture will be dependent upon outcome of the sample cleaning procedures to be demonstrated on the mock-up. Mock-ups must match work in progress for length of exposure to accurately replicate site conditions.
2. Locate mockups in the locations indicated or, if not indicated, as directed by WSU Project Manager.
3. Build mockups for the following types of masonry in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.
   a. Typical exterior wall in each color and face texture provided
   b. Typical interior wall in each color and face texture provided

4. Clean exposed faces of mockups with masonry cleaner as indicated. Exactly match cleaning procedures that will be utilized.

5. Notify Architect seven days in advance of dates and times when mockups will be constructed.

6. Protect accepted mockups from the elements with weather-resistant membrane to replicate job-site conditions.

7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

8. Approval of cleaning mockups is for texture, consistency of cleaning procedure and aesthetic qualities of workmanship.
   a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.

9. Demolish and remove mockups when directed.

G. Preinstallation Conference: Conduct conference at Project site to ensure compliance with all requirements in Division 1 Section "Project Meetings." Installation of any masonry will not commence until after this meeting.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
   1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.

B. Store 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 designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: For masonry exposed to elements, 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. Any damage and/or discoloration due to failure to protect the masonry will result in a notice of non compliance and removal and replacement of the work at the contractor’s expense.

1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
2. Where on wythe of multiwythe masonry walls is completed in advance of other wythes, secure, cover a minimum of 24 inches (600mm) 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 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
   1. When ambient temperature exceeds 90 deg F (32 deg C), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.

E. 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 ACI 530.1/ASCE 6/TMS 602 and in table that follows.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
### Temperature (see note)  | Construction Requirements | Protection Requirements |
<table>
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<tr>
<td>100 °F - 40 °F (38 °C - 4 °C)</td>
<td>Normal procedures.</td>
<td>Cover walls with plastic or canvas at end of work day to prevent water from entering masonry.</td>
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<td>40 °F - 32 °F (4 °C - 0 °C)</td>
<td>Heat mixing water or sand to produce mortar between 40 °F - 120 °F (4 °C - 49 °C). Heat grout materials so grout is placed at a temperature between 40 °F - 120 °F (4 °C - 49 °C) and grout above freezing until used in masonry.</td>
<td>Completely cover newly constructed masonry with a weather resistant membrane for 48 hr after construction.</td>
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<tr>
<td>32 °F - 25 °F (0 °C - 4 °C)</td>
<td>Heat mixing water and sand to produce mortar between 40 °F - 120 °F (4 °C - 49 °C). Heat grout materials so grout is placed at a temperature between 40 °F - 120 °F (4 °C - 49 °C) and grout above freezing until used in masonry.</td>
<td>Completely cover newly constructed masonry with a weather resistant membrane for 48 hr after construction.</td>
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<td>25 °F - 20 °F (0 °C - 4 °C)</td>
<td>Heat mixing water and sand to produce mortar between 40 °F - 120 °F (4 °C - 49 °C). Heat grout materials so grout is placed at a temperature between 40 °F - 120 °F (4 °C - 49 °C) and grout above freezing. Heat masonry units to 40 °F (4 °C) if grouting. Use heat sources on both sides of walls under construction.</td>
<td>Completely cover newly constructed masonry with insulating blankets or equal protection for 48 hr to prevent freezing. Install wind breaks when wind velocity exceeds 15 mph (6.7 m/s).</td>
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<td>20 °F and Below (-7 °C and Below)</td>
<td>Heat mixing water and sand to produce mortar between 40 °F - 120 °F (4 °C - 49 °C). Heat grout materials so grout is placed at a temperature between 40 °F - 120 °F (4 °C - 49 °C). Heat masonry units to 40 °F (4 °C). Use heat sources on both sides of walls under construction. Provide enclosure and heat to maintain temperatures above 32 °F (0 °C) within the enclosure.</td>
<td>Provide enclosure and heat to maintain temperatures above 32 °F (0 °C) within the enclosure for 48 hr after construction. Heat may be provided by electric heating blankets, infrared heat lamps or other approved methods.</td>
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# PART 2 - PRODUCTS

## 2.1 CONCRETE MASONRY UNITS

### A. General: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide **bullnose units** for outside corners, unless otherwise indicated.

### B. Concrete Masonry Units: ASTM C 90 and as follows:

1. **Unit Compressive Strength:** Provide units with minimum average net-area compressive strength of 1900 psi 17.2 Mpa for unit only
2. Weight Classification: LightWeight
3. Provide Type I, moisture-controlled units
4. Size (Width): Manufactured to the following dimensions:
   a. 8, 10 and 12 inches nominal; 7-5/8, 9-5/8 and 11-5/8 inches actual. See drawings.
   b. Other nominal sizes as shown.
5. Products:
   a. Standard CMU.
   b. Honed CMU
      1) Approved Manufacturers: Lehi, Buehner, Amcor or approved equal.
6. Block and Mortar color: To be selected by WSU Project Manager.

2.2 BRICK

A. General: Provide shapes indicated and as follows for each form of brick required.

B. Face Brick: ASTM C 216 Grade SW, Type FBS or FBX as required to match campus standard and as follows:
   1. Unit Compressive Strength: provide units with minimum average net-area compressive strength of 2000 psi (15.7 MPa) for units only.
   2. Initial Rate of Absorption: Less than 20 g/30sq. in. (20g/194 sq. cm) per minute when tested per ASTM C 67.
   3. Efflorescence: provide brick that has been tested according to ASTM C 67 and is rated “not effloresced”.
   4. Surface Coloring: Brick with surface coloring other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3m).
   5. Brick Color/Type: Match size of existing brick veneer on campus.
      a. Color #1: Match Interstate Brick “Golden Buff”.
      b. Approved Manufacturers: Interstate Brick; Interpace Brick, Robinson Brick.

6. Colored Mortar: Match Davis Colors/True Tone Terracotta (1.5 pounds per 70 pounds) MC-52.

2.3 MORTAR AND GROUT MATERIALS

A. General: Mortar mixes shall match existing, unless otherwise noted by WSU Project Manager.

B. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207. Color to match existing.

C. Mortar Cement: ASTM C 1329.
   1. For pigmented mortar, use a colored cement formulation as required to produce the color indicated or as selected from manufacturer’s standard formulations by WSU Project Manager.
      a. Pigments shall not exceed 5 percent of mortar cement by weight for mineral oxides or 1 percent for carbon black.
   2. For colored-aggregate mortar, use natural color or white cement as necessary to produce required mortar color.
D. Aggregate for Mortar: ASTM C 144; except for joints less than ¼ inch (6.5mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.19-mm) sieve.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

2.4 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA’s “Architectural Sheet Metal Manual” and as follows.

1. Copper: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet, 100-oz./sq. ft. (3-dk/sq. m) weight or 0.0135 inch (0.34mm) thick for fully concealed flashing, 16-oz./sq. ft. 9d-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick elsewhere.

2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but no exceeding 12 feet (3.6M). Provide splice plates at joints of formed, smooth metal flashing.

3. Fabricate through-wall metal flashing embedded in masonry from copper, with ribs at 3-inch (75-mm) intervals along length of flashing to provide an integral mortar bond.
   a. Available Products:
      1) Cheney Flashing Company, Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth) or approved equal.
      2) Keystone Flashing Company, Inc.; 3-Way Interlocking Thruwall Flashing or approved equal.

4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.

5. Fabricate through-wall flashing with sealant stop, unless otherwise indicated. Fabricate joint 3/8 inch (10mm) to form a stop for retaining sealant backer rod.

6. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches (75 mm) into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.

7. Metal Drip Edges: Fabricate from copper. Extend at least 3 inches (75mm) into wall and ½ inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.

8. Metal Expansion-Joint Strips: Fabricate from copper to shapes indicated.

B. For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Asphalt-Coated Copper Flashing: 7-oz./sq. ft. (2-kg/sq. m) copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
   a. Available products:
      1) Advanced Building Products Inc.; Cop-R-Cote.
      2) AFCO Products Inc.; Cop-A-Cote
      3) Hohmann & Barnard, Inc. H & B C-Coat Flashing
      4) Phoenix Building Products; Type ACC-Asphalt Bituminous Coated.
      5) Polylite Manufacturing Corp; Coated Copper Flashing
      6) Sandell Manufacturing Co. Inc.; Coated Copper Flashing
      7) York Manufacturing, Inc.; Copperseal.
      8) Or approved equal.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer’s standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
2.5 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A615M, ASTMA 616/A 616M, including Supplement 1; or ASTM A617/A617M, Grade 60 (Grade 400).

2.6 MASONRY JOINT REINFORCEMENT

A. General: ASTM A 951 and as follows:
   1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
   2. Wire Size for Side Rods: W1.7 or 0.148-inch (3.8-mm).
   3. Wire Size for Cross Rods: W1.7 or 0.148-inch (3.8-mm).
   4. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units where indicated.

B. For single-wythe masonry, provide truss type with single pair of side rods and cross rods spaced not more than 16 inches (407 mm) o.c.

C. For Multiwythe masonry, provide types as follows:
   1. Ladder type with perpendicular cross rods spaced not more than 16 inches (407 mm) o.c. and 1 side rod for each face shell of hollow masonry units more than 4 inches (100 mm) in width, plus 1 side rod for each wythe of masonry 4 inches (100 mm) or less in width.

2.7 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180), commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.

2.8 BENT WIRE TIES

A. General: Rectangular units with closed ends and not less than 4 inches (100 mm) wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long may be used for masonry constructed from solid units or hollow laid with cells horizontal.
   1. Where coursing between wythes does not align, use adjustable ties composed of 2 parts, 1 with pintsles, the other with eyes; with maximum misalignment of 1 ¼ inches (32 mm).
   2. Where wythes are of different material, use adjustable ties composed of 2 parts; 1 with pintsles, the other with eyes; with maximum misalignment of 1-1/4 inches (32 mm).

B. Wire: Fabricate from 3/16-inch (4.8 mm) hot dip galvanized steel wire.

2.9 ADJUSTABLE MASONRY – VENEER ANCHORS

A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
1. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3mm).

B. Seismic Masonry –Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in the veneer mortar joint, complying with the following requirements:
   1. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom 2-3/4 inches (70 mm) wide by 3 inches (75 mm) high; with projecting tabs having slotted holes for inserting vertical leg of connector section.
   2. Connector Section: Rib-stiffened, sheet metal bent plate with down-turned leg designed to fit in anchor section slot and with integral tabs designed to engage continuous wire. Size connector to extend at least halfway through veneer but with at least 5/8 inch (18 mm) cover on outside face.
   3. Fabricate sheet metal anchor sections and other sheet metal parts from 0.0677 inch (1.7 mm) thick, steel sheet, galvanized after fabrication.
   4. Fabricate wire connection sections from 0.1875 inch (4.8 mm) hot dip galvanized steel wire.
   5. Continuous Wire: 0.1875 inch (4.8 mm) diameter, hot dip galvanized steel wire.

C. Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 (4.8 mm) diameter by length required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion protective coating.
   1. Organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.

D. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Seismic Masonry-Veneer Anchors:
      a. D/A 213S; Dur-O-Wal, Inc.
      b. DW-10/-10 HS-Seismiclip; Hohmann & Barnard, Inc.
      c. Or approved equal

   2. Organic-Polymer-Coated, Steel Drill Screws
      a. Dril-Flex; Elco Industries, Inc.
      b. Traxx; ITW-Buildex
      c. Or approved equal

2.10 MISCELLANEOUS ANCHORS

A. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Type: Chemical anchors.
   2. Type: Expansion anchors.
   3. Type: Undercut anchors.
   5. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
   6. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.
2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch (9-mm) OD by 4 inches (100 mm) long.

D. Cavity Drainage Material: thickness to match cavity dimension, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.

E. Available products: Subject to compliance with requirements, cavity drainage materials that may be incorporated into the Work include, but are not limited to, the following:
   1. Cavity Drainage Material:
      b. CavClear Masonry Mat; CavClear
      c. Mortar Net; Mortar Net USA, Ltd.
      d. Mortar Stop; Polytite Manufacturing Corp.
      e. Or approved equal

2.12 MASONRY-CELL INSULATION

A. Loose-Granular Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

2.13 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry measure laundry detergent dissolved in 1 gal. (4 L) of water.

B. Proprietary Acidic 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.
   1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
      a. Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching.
         1) 202 New Masonry Detergent; Diedrich Technologies, Inc.
         2) NMD 80; EaCo Chem Inc.
         3) Sure Klean No. 600 Detergent; ProSoCo. Inc.
         4) Or approved equal.

2.14 MORTAR AND GROUT MIXES
A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to the following:

1. Pre-Blended Mortar for Mixing in a Silo.
   a. Quikrete Mason Mix (No. 1136)
   b. Sakrete Mortar Mix, Type S and Type N
   c. Spec Mix
   d. Or approved equal


1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
2. For reinforced masonry and where indicated, use Type S.
3. For interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.
4. Interior and Exterior Brick Veneer: Type N or S

E. Grout for Unit Masonry: Comply with IBC Table 2103.10 or ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.2 of ACI 530./ASCE 5/TMS 402 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
2. Verify that reinforcing dowels are properly placed.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

A. Thickness: Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tester per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

F. Storage: Store CMU and brick on pallets above grade, cover and protect from weather until placed. Units in contact with paving, grade or exposed to the weather will not be used.

3.3 CONSTRUCTION TOLERANCES

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

B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).

F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/16 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/16 inch (3 mm).

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. Do not use less-than-half-size units, particularly at corners, jambs, and at other locations unless approved by WSU Project Manager.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
1. To match adjacent patterns, if present, otherwise all masonry to be placed in running bond pattern.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
3. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

J. Cover tops of walls & window sills after each days work and until flashings are installed.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.

C. Set trim units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone-joint surface thoroughly before setting; for soiled surfaces, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
3.6 MASONRY-CELL INSULATION

A. Pour granular insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to 1 story in height, but not more than 20 feet (6 m).

3.7 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.
   a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing or back-up wythe with seismic masonry-veneer anchors to comply with the following requirements:
   1. Fasten each anchor section through sheathing to wall framing with two metal fasteners of type indicated or embed in joints of interior wythe.
   2. Embed connector sections and continuous wire in masonry joints. Provide air space as indicated on drawings between back of masonry veneer and face of sheathing or back-up wythe.
   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 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. (0.33 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of opening and at intervals, not exceeding 36 inches (914 mm) around perimeter.

3.9 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
   1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.
3.10 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

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

B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.11 CAVITIES

A. Keep cavities clean of mortar droppings and other materials during construction.

1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.

3.12 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

C. Install flashing as follows:

1. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches (200 mm) and behind air-infiltration barrier of building paper.

2. At lintels and shelf angles, extend flashing a minimum of 4 inches (100 mm) into masonry at each end. At heads and sills, extend flashing 4 inches (100 mm) at ends and turn flashing up not less than 2 inches (50 mm) to form a pan.

3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.

4. Cut flashing off flush with face of wall after masonry wall construction is completed.

D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:

1. Use plastic weep hole/vents to form weep holes.
2. Space weep holes formed from plastic tubing 16 inches (400 mm) o.c.
3. Place cavity drainage material immediately above flashing in cavities.

E. Install vents in vertical head joints at the top of each continuous cavity at spacing indicated. Use round plastic tubing to form vents.

F. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement. Initial repair should be approved by WSU Project Manager before subsequent repairs or replacements are executed.

B. Pointing: During the toothing of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before toothing 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 nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Where amount of staining is severe, or detergent cleaning is ineffective, clean masonry with a brick manufacturer approved acidic cleaner applied according to manufacturer's written instructions. Requires WSU Project Manager pre-approval.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.14 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess masonry and masonry waste and legally dispose of off WSU property. Masonry waste cannot be used as fill.

END OF SECTION 04810