SECTION 04810
UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units.
   2. Mortar and grout.
   3. Reinforcing steel.
   4. Masonry joint reinforcement.
   5. Ties and anchors.

B. Related Sections:
   1. Division 5 Section "Metal Fabrications".
   2. Division 7 Section “Fire Resistive Joint Systems" for firestopping at tops of masonry walls and at openings in masonry walls.

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced to in the text by the basic designation only.

B. The edition/revision of the referenced publications shall be the latest as of the date of the Contract Documents, unless otherwise noted.

C. American Concrete Institute (ACI):
   1. ACI 530.1/ASCE 6/TMS 602: Specification for Masonry Structures

D. American Society for Testing and Materials (ASTM):
   1. ASTM A 36/A: Specification for Carbon Structural Steel
   2. ASTM A 82: Specification for Steel Wire, Plain, for Concrete Reinforcement
   3. ASTM A 153: Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
   4. ASTM A 615/A: Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement
   5. ASTM A 653/A: Specification for Steel Sheet Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process
   6. ASTM A 951: Specification for Masonry Joint Reinforcement
   7. ASTM C 90: Specification for Loadbearing Concrete Masonry Units
   8. ASTM C 143: Test Method for Slump of Hydraulic Cement Concrete
   9. ASTM C 144: Specification for Aggregrate for Masonry Mortar
   10. ASTM C 150: Specification for Portland Cement
   11. ASTM C 207: Specification for Hydrated Lime for Masonry Purposes
   12. ASTM C 270: Specification for Mortar for Unit Masonry
   13. ASTM C 404: Specification for Aggregates for Masonry Grout
   14. ASTM C 476: Specification for Grout for Masonry
   15. ASTM C 1093: Practice for Accreditation of Testing Agencies for Unit Masonry
   16. ASTM C 1314: Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry

17. ASTM C 1329: Specification for Mortar Cement
18. ASTM E 119: Test Method for Fire Tests of Building Construction and Materials
19. ASTM E 548: Guide for General Criteria Used for Evaluating Laboratory Competence

E. National Concrete Masonry Association (NCMA):
1. NCMA TEK 8-2: Removal of Stains from Concrete Masonry Walls

1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following net-area compressive strengths (f'm) at 28 days. Determine compressive strength of masonry units and mortar types according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
1. For Concrete Unit Masonry: f'm = 1500 psi.

B. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the following preconstruction testing:
1. Prism Test: For each type of wall construction indicated, per ASTM C 1314

1.5 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.

C. 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.
2. Mortar complying with property requirements of ASTM C 270.
3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.

D. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Each type of masonry unit required.
2. Each cement product required for mortar and grout, including name of manufacturer, brand, and type.
3. Each type of sand for mortar and grout
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.

1.6 QUALITY ASSURANCE

A. Contractor's 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. Preconstruction Testing Service Contractor's Testing Agency shall perform the following tests.
   1. Mortar Test: For mortar properties per ASTM C 270.
   2. Grout Test: For compressive strength per ASTM C 1019.

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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. 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.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely 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 surfaces of metal frames, as well as similar products with painted and integral finishes, from mortar droppings.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. 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 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

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 square-edged units for outside corners, unless indicated as bullnose.

B. Concrete Masonry Units: ASTM C 90 and as follows:
1. Weight Classification: Medium weight or lightweight
2. Provide Type I, moisture controlled units.
3. Size (Width): Manufactured to the following dimensions:
a. 4 inches nominal; 3-5/8 inches actual.
b. 6 inches nominal; 5-5/8 inches actual.
c. 8 inches nominal; 7-5/8 inches actual.
d. 10 inches nominal; 9-5/8 inches actual.
4. Exposed Faces: Manufacturer's standard color and texture.

2.2 MORTAR AND GROUT MATERIALS

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

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I, II, or Type III, and hydrated lime complying with ASTM C 207 Type S.

D. Mortar Cement: ASTM C 1329.

E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

F. Aggregate for Grout: ASTM C 404.

G. Water: Potable.

2.3 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615, Grade 60.

2.4 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 diameter.
   3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
   4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.

B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.

2.5 TIES AND ANCHORS, GENERAL

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

B. Galvanized Steel Sheet: ASTM A 653, G60, commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.

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

D. Steel Plates, Shapes, and Bars: ASTM A 36.

2.6 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME

A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire anchor section for welding to steel.
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch-diameter, hot-dip galvanized steel wire.

2.7 ANCHORS FOR CONNECTING TO CONCRETE

A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section: Dovetail anchor section formed from 0.0528-inch- thick, steel sheet, galvanized after fabrication.
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch- diameter, hot-dip galvanized steel wire.

2.8 RIGID ANCHORS

A. General: Fabricate from steel bars as follows:
   1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.
   2. Finish: Hot-dip galvanized to comply with ASTM A 153.

2.9 MASONRY CLEANERS

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

2.10 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. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
   1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
   2. For CNMS CMU partitions, Type S.
   3. For load bearing partitions, Type S.
   4. For all other interior non-load-bearing partitions, Type O, Type N or Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
   2. Provide grout with a slump of 8 to 11 inches 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 foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
   4. Proceed with installation only after unsatisfactory conditions have been corrected.

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

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

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

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction.

Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

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, nor 1/2 inch maximum.

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

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

E. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
   1. One-half running bond with vertical joint in each course centered on units in courses above and below.

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

D. 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.

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

F. 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.

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

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Fire Resistive Joint Systems."

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.

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

3.6 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

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

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

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
   1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
   2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:
   1. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint.
   2. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete.

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

3.9 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches 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 at each jamb, unless otherwise indicated.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

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

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Construction Manager's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.11 REINFORCED UNIT MASONRY INSTALLATION

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

1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

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

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

END OF SECTION 04810