

SECTION 04 22 23
ARCHITECTURAL CONCRETE MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Architectural concrete masonry exterior wall veneer facing.
- B. Architectural concrete masonry exterior single wythe walls.

1.2 RELATED SECTIONS

- A. Section 04 05 13.23 - Surface Bonding Masonry Mortaring
- B. Section 04 05 16.26 - Engineered Masonry Grouting.
- C. Section 04 05 19.29 - Stone Anchors.
- D. Section 04 05 19.19 - Masonry Cavity Drainage, Weepholes, and Vents*.
- E. Section 05 20 00 - Metal Joists.
- F. Section 05 50 00 - Metal Fabrications.
- G. Section 07 62 00 - Sheet Metal Flashing and Trim.
- H. Section 07 65 26 - Self-Adhering Sheet Flashing.
- I. Section 07 90 00 - Joint Protection.

1.3 REFERENCES

- A. ASTM C 33 - Standard Specification for Concrete Aggregates.
- B. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- C. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units.
- D. ASTM C 91 - Standard Specification for Masonry Cement.
- E. ASTM C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
- F. ASTM C 140 - Standard Specification for sampling and testing Concrete Masonry Units.
- G. ASTM C 150 - Standard Specification for Portland Cement.
- H. ASTM C 331 - Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
- I. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of

Mortars for Plain and Reinforced Unit Masonry.

- J. ASTM C 1019 - Standard Test Method for Sampling and Testing Grout.
- K. ASTM C 1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength.
- L. ASTM C 1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.
- M. ASTM C 1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
- N. ASTM C 1506 - Standard Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters.
- O. ASTM D 2000 - Standard Classification System for Rubber Products in Automotive Applications.
- P. ASTM D 2287 - Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
- Q. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
- R. ASTM E 514 - Standard Test Method for Water Penetration and Leakage Through Masonry.
- S. TMS 402-13 / ACI 530-13 / ASCE 5-13 - Building Code Requirements for Masonry Structures.
- T. TMS 602-13 / ACI 530.1- 13 / ASCE 6-13 - Specification for Masonry Structures.
- U. NCMA TEK Bulletin 3-1C - All Weather Concrete Masonry Construction.
- V. NCMA TEK Bulletin 3-2A - Grouting for Concrete Masonry Walls.
- W. NCMA TEK Bulletin 3-3A - Reinforced Concrete Masonry Construction.
- X. NCMA TEK Bulletin 8-2A - Removal of Stains from Concrete Masonry Walls."
- Y. NCMA TEK Bulletin 10-1A - Crack Control in Concrete Masonry Walls.
- Z. NCMA TEK Bulletin 10-2B - Control Joints for Concrete Masonry Walls.
- AA. NCMA TEK Bulletin 14-4A - Strength Design of Concrete Masonry.
- BB. NCMA TEK Bulletin 19-4A - Flashing Strategies for Concrete Masonry Walls.
- CC. NCMA TEK Bulletin 19-5A - Flashing Details for Concrete Masonry Walls.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Concrete Unit Masonry Construction: Comply with the following:
 - 1. TMS 602-13 / ACI 530.1- 13 / ASCE 6-13 - Building Code Requirements for Masonry Structures.
 - 2. TMS 602-13 / ACI 530.1- 13 / ASCE 6-13 - Specification for Masonry Structures.
 - 3. National Concrete Masonry Association (NCMA) TEK Bulletins.
- B. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days
 - 1. Determine net-area compressive strength of masonry from average net-area

compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in TMS 402/ ACI 530.1/ASCE 5 and TMS 602/ ACI 530.1/ ASCE 6

2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.
- C. **[For HI-R or HI-R-H specifications only]** Pre-installed two piece, interlocking, Concrete Masonry Unit Insulation.
1. Description: Concrete Block Insulation Systems, Inc. expanded polystyrene Insulation Inserts made from flame-retardant treated expandable polystyrene, such as [KORFIL Block Insulation], [KORFIL Hi-R Insulation], [KORFIL Hi-R-H Insulation], and/or [ICON Universal Inserts] which are pre-installed in CMU's prior to delivery to jobsite;
 2. Physical Properties:
 - a. Moisture Absorption: < 1.0% by volume
 - b. Flame Spread Characteristics:
 - _____ASTM E 84 –Flame Spread < 5
 - _____ASTM E 119 – Insert shall cause no reduction in hourly rating.
 - c. Thermal Resistance (R) per inch of thickness = 5.00
 - d. Rot & Vermin Resistance: Produced from expanded polystyrene – fully resistant to rot; does not attract vermin, termites or rodents.
 - e. Density: ASTM C 303 – 20.8 kg/m³ (1.3 lb./cu. ft.) to 32.0 kg/m³ (2.0 lb./cu. ft.)
 - f. Components: Insulation shall contain no fluorocarbons and no formaldehyde.
 - g. Shape: Two-piece, interlocking insert shall overlap at both head & bed joints with edges of adjacent inserts of the same type. Keyway shall be provided for butt welded cross-rods of 16" o.c. ladder type horizontal wall reinforcement.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.
 2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
 3. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
 5. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
 6. Prism Test: For each type of construction required, according to ASTM C 1314.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used:
1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods including written plan for cold and hot weather construction and masonry cleaning procedures.
- C. Selection Samples: Submit three full size units of each type/color of exposed architectural concrete masonry unit for review of color and texture to verify compliance with products specified. Provide the maximum color and texture variation range expected in the finished

work. Production orders may be released after submittals are approved.

- D. Manufacturer's Certificates and Test Reports: Certify products meet or exceed specified requirements. Test reports should be within 12 months of bid date.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in TMS 602/ACI 530.1/ASCE 6.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum ten years documented experience and a current member in good standing of the National Concrete Masonry Association.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience with projects of similar scope and complexity.
- C. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of masonry work while it is in progress.
- D. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- E. Source Limitations: Provide each type of masonry unit from a single manufacturing source to ensure uniform texture and color for continuous and visually related items.
- F. Mock-Up: Prior to starting masonry work build sample wall panel(s) for Architect's inspection and acceptance. Build panel(s) on a firm foundation, in location acceptable to the Architect. Panel(s) shall be L-shaped, with long side a minimum of 5 foot 4 inches long by 4 foot 0 inches high and with one corner return at least 2 foot 0 inches long. Construct sample panel(s) full thickness, installing wall reinforcement, anchors, ties and other required accessories. Provide special features as directed for control joints, weeps, etc. Panel(s) shall show color range and texture of masonry units, bond, mortar joints and workmanship to be expected for the project.
 - 1. Build sample panels for:
 - a. Each type of exposed unit masonry construction.
 - b. Typical exterior wall.
 - c. Typical interior wall.
 - d. Typical exterior and interior walls.
 - 2. Clean one-half of each sample panel using approved masonry cleaning materials and methods to represent final cleaning. Remaining one-half to remain without final cleaning for comparison purposes.
 - 3. Retain sample panels during construction as a standard for judging completed masonry work. Do not alter, move, or destroy sample panels until work is completed or removal is authorized.

1.8 PRE-INSTALLATION CONFERENCE

- A. Convene an architectural masonry conference approximately two weeks before scheduled commencement of masonry construction and associated work.
- B. Require attendance of installers of components that are to be built-into or otherwise concerned with masonry performance, and installers of other work in and around the masonry which must precede or follow the work and including the Architect, Owner, window, door and roofing representatives and the architectural masonry manufacturer's representative.
- C. Objectives include:
 - 1. Review foreseeable methods and procedures related to masonry work, including set up and mobilization areas for stored material and work area.
 - 2. Tour representative areas to receive masonry, inspect and discuss condition of substrate, penetrations and other preparatory work.
 - 3. Review work of other trades and make provisions to permit installation of their work in a manner to avoid cutting and patching.
 - 4. Review masonry requirements, Drawings, Specifications and other Contract Documents, including these topics:
 - a. Review and critique the completed Sample panel(s) under diffused light.
 - b. Demonstrate cleaning procedures on the sample panel.
 - c. Set schedule for pre-cleaning meeting and cleaning after installation.
 - d. Location of Movement (Control) Joints.
 - e. Use of compatible water repellent admixtures for mortar.
 - f. Availability of clean and potable water for project.
 - g. Installation of flashing details.
 - h. Open issues and concerns.
 - i. Cold/Hot weather procedures.
 - j. Protecting masonry during constructing, including covering walls.
 - k. Post-applied breathable sealant.
 - 5. Review and finalize schedule related to masonry and related work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
 - 6. Review required inspection, testing, certifying procedures.
 - 7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
 - 8. Record conference including decisions and agreements reached. Furnish a copy of records to each party attending.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver architectural concrete masonry units to the job site on wood pallets with manufacturer's recommended unit protective covers.
- B. Inspect architectural concrete masonry units upon delivery to ensure color match with required materials and accepted samples.
- C. Stack masonry units in a dry place off the ground on pallets or a prepared plank platform. Method of stacking is acceptable. Protect with non-staining waterproof tarpaulin coverings arranged to allow air circulation around and above masonry units.
- D. Exercise care in the storage, handling and installation of masonry units. Do not build soiled or damaged masonry units into the work.

1.10 SEQUENCING

- A. Ensure that locating templates and other information required from others for built-in installation of products of this section are furnished in time to prevent interruption of construction progress.

1.11 PROJECT CONDITIONS

- A. Follow hot weather and cold weather requirements in the masonry code and specifications, TMS 402 and TMS 602.

- B. Cold Weather Procedures:

- 1. Preparation:

- a. If ice or snow has formed on the masonry bed, remove it by carefully applying heat not to exceed 120 degrees F until the surface is dry to the touch.
 - b. Remove any brick units or mortar that is frozen or damaged.
 - c. When the clay masonry unit suction exceeds 30 grams per minute per 30 square inches, sprinkle with heated water as follows:
 - 1) When units are 32 degrees F or above, heat water to 70 degrees F or above.
 - 2) When units are below 32 degrees F, heat water to 130 degrees F or above.

- 2. Work in Progress:

- a. Air temperature 40 degrees F to 32 degrees F:
 - 1) Heat sand or mixing water to produce mortar temperatures that match air temperature.
 - b. Air temperature 32 degrees F to 25 degrees F:
 - 1) Heat sand and mixing water to produce mortar temperatures between 40 degrees F and 120 degrees F.
 - 2) Maintain temperature of mortar on boards above freezing.
 - 3) Installation in colder air temperatures will require heat sources on the wall and the use of windbreaks or tents to create a controlled environment suitable for proper bonding and curing.

- 3. Completed Work and Work Not in Progress:

- a. Mean daily air temperature of 40 degrees F to 32 degrees F: Protect masonry from rain and snow for 24 hours by covering with a weather-resistive membrane.
 - b. Mean daily air temperature of 32 degrees F to 25 degrees F: Cover masonry with a weather-resistive membrane for 24 hours.
 - c. Mean daily air temperature of 25 degrees F to 20 degrees F: Cover masonry with insulating blankets for 24 hours.

- C. Hot Weather Procedures:

- 1. When ambient temperature exceeds 90 degrees F and wind exceeds 8 miles per hour:

- a. Maintain temperature of mortar and grout between 70 degrees F and 120 degrees F.
 - b. Limit the spread of the mortar bed to 4 feet and place units within 1 minute of spreading mortar.
 - c. Control moisture evaporation in partially or newly completed walls by fog spraying with potable water, covering with opaque plastic or canvas or both.

- 2. Protection of Work in Progress:

- a. Covering:

- 1) Cover tops of walls with a strong waterproof membrane at the end of each day or work shutdown. Extend the waterproof membrane cover a minimum of 24 inches down the side of each wall.
 - 2) Hold cover securely in place.

- b. Load Application:
 - 1) Do not apply uniform floor or roof loading for at least 12 hours after completing columns and walls.
 - 2) Do not apply concentrated loads for at least 3 days after completing columns and walls.
 - c. Staining:
 - 1) Prevent grout and mortar from staining the face of masonry.
 - 2) Remove grout and mortar that comes in contact with masonry units immediately.
 - 3) Protect sills, ledges and projections from mortar droppings.
 - 4) Protect base of wall from rain-splashed mud and mortar splatter.
 - 5) Turn scaffold boards on edge when work is not in progress to lessen splattering.
- D. Coordination: Coordinate Work to ensure top of wall is covered and remains covered until properly block openings are protected with coping or finishing system indicated on the Drawings

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Concrete Products Group, which is located at: 221 Bolivar St. Suite 200; Jefferson City, MO 65101; Contact: Bill Dawson, Toll Free Tel: 800-789-0872; Email: bdawson@concreteproductsgroup.com. Web: www.concreteproductsgroup.com
 - 1. Regional Manufacturers: Mountain & West:
 - a. Basalite Concrete Products, LLC, Dixon, CA, www.basalite.com
 - b. Orco Block Co., Inc., Stanton, CA, www.orco.com
 - c. Western Materials., Yakima, WA, www.westernmaterials.com
 - 2. Regional Manufacturers: Midwest
 - a. Amcon Concrete Products, LLC, Mendota Heights, MN, www.amconconcreteproducts.com
 - b. Fendt Builder's Supply, Inc. Farmington Hills, MI, www.fendtproducts.com/
 - c. Midwest Block & Brick, St. Louis, MO, www.midwestblock.com
 - d. Midwest Block & Brick, Kansas City, MO, www.midwestblock.com
 - e. Midwest Block & Brick, Tulsa OK, www.midwestblock.com
 - f. Oberfields LLC, Delaware, OH, www.oberfields.com
 - 3. Regional Manufacturers: South & Southeast
 - a. Best Block Construction Materials, Houston, TX, www.bestblock.com
 - b. Johnson Concrete Company - Salisbury NC www.johnsoncmu.com
 - 4. Regional Manufacturers: East
 - a. A. Jandris & Sons, Inc., Gardner, MA, www.ajandris.com
 - b. Barnes & Cone, Syracuse, NY, www.barnesandcone.com
 - c. Dagastino Building Blocks, Inc. <https://www.dagblock.com/>
 - d. Fizzano Brothers, Crum Lynne, PA, www.fizzano.com
 - e. A-1 Block, Orlando FL, www.a1block.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIALS

- A. Aggregate:
 - 1. ASTM C 33 normal weight aggregate.
 - 2. ASTM C 331 lightweight aggregate.

- B. Cement: ASTM C 150, Type required. Color, White/Grey as required for use with the color specified.
- C. Water Repellent Admixture: Integral polymeric water repellent admixture for concrete masonry units used in masonry exposed to the exterior.
 - 1. Performance requirements:
 - a. Water resistance: ASTM E 514
- D. Color Pigments: Lightfast, alkali-resistant, weather-resistant natural or synthetic iron oxides manufactured specifically for use in concrete masonry units.

2.3 ARCHITECTURAL CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Units: Provide unit type and size(s) indicated on the drawings
 - 1. Masonry units meeting all ASTM C 90 testing requirements and containing integral mixed color **[select applicable products]:**
 - a. Spec-Brik structural masonry units [optional: with Water Control Technology (WCT)]
 - b. Spec-Brik masonry veneer units
 - c. Spec-Brik Jumbo structural masonry units.
 - d. Spec-Thermal Hi-R Half High Insulated masonry units (Spec-Brik HI-R when using Spec-Brik blended colors)
 - e. Spec-Thermal Hi-R-H Half High insulated masonry units (Spec-Brik HI-R-H when using Spec-Brik blended colors)
 - f. Spec-Thermal Hi-R insulated Masonry Units.
 - g. Spec-Thermal Hi-R-H insulated Masonry Units.
 - h. Spec-Surface smooth and dense masonry units for painting.
 - i. Spec-Split - Splitface masonry units
 - j. Polished and Textured specialty masonry units.
 - 2. Unit Weight:
 - a. Normal weight units.
 - b. Lightweight units.
 - 3. Linear shrinkage: Not to exceed 0.065 percent, ASTM C 90.
 - 4. Unit Compressive Strength: Minimum net area compressive strength of 2,000 psi.
 - 5. Integral Water Repellent Concrete Masonry Units: Provide all exterior wall architectural concrete masonry units, including single wythe walls and facing units, containing the manufacturer's recommended type and amount of an integral polymeric water repellent admixture.
 - 6. Color:
 - a. As selected by Architect from manufacturer's standard colors
 - b. Custom color matching Architect's sample color.
- B. **[If Applicable]: Pre-installed two-piece, interlocking Concrete Masonry Unit Insulating Inserts:**
 - 1. **Product: Korfil Hi-R or Hi-R H inserts manufactured by Concrete Block Insulating Systems and distributed by members of the Concrete Products Group (choose applicable insert):**
 - a. Korfil Hi-R insert (for 8" nominal height two web units)
 - b. Korfil Hi-R H insert (for 8" nominal height single web units)
 - c. Korfil HI-R Half High insert (for 4" nominal height two web units)
 - d. Korfil Hi-R H Half Highinsert (for 4" nominal height one web units)
- C. Special shapes:
 - 1. Provide closures, jamb units, headers, lintels, bond beams and other special shapes as indicated.
 - 2. Provide standard manufactured sizes or cut full size units for fractional course height and lengths.

2.4 MASONRY ACCESSORIES

- A. Mortar and grout: Comply with Sections 04060 and 04070. Provide water repellent admixture for exterior wall mortar and grout.
 - 1. Water Repellent Mortar Admixture: Exterior wall mortar admixture shall be compatible to the admixture used to produce the masonry units. Coordinate the selection with the masonry unit manufacturer.
 - 2. Comply with manufacturer's instructions for mixing and mortar preparation.
 - 3. When using bulk pre-blended mortar (silos, bulk bags, etc.) with dry admixture, the admixture in the pre-blended mortar MUST be from the same producer or compatible with that used in the CMU materials.
- B. Masonry Anchorage and Reinforcement: Comply with applicable portions of TMS 602 Article 2.4, and/or Section 04 05 19.29 - Stone Anchors.
- C. Fabricated Steel Lintels: Comply with Section 05 50 00 - Metal Fabrications.
- D. Sheet Metal Flashing and Trim: Comply with Section 07 62 00 - Sheet Metal Flashing and Trim.
- E. Flexible Flashing: Comply with Section 07 65 26 - Self-Adhering Sheet Flashing.
- F. Pan Flashing: BlockFlash, by MortarNet in single wythe walls.
- G. Foamed-in-place insulation materials and installation: Comply with Section 07 21 29 - Spray Foam Insulation.
- H. Control Joints:
 - 1. Rubber: ASTM D 2000.
 - 2. Vinyl: ASTM D 2287.
- I. Weeps: Weeps are to be used in conjunction with flashing materials for proper functioning of the masonry wall drainage system. Specified weep material is:
 - 1. Weep holes, weep tubes, plastic vents or cells in veneer wall systems such as from Hohmann & Barnard, or equivalent.
 - 2. BlockFlash, by MortarNet in single wythe walls
- J. Masonry Cleaning Materials: Standard-strength proprietary masonry cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new concrete masonry without discoloring or damaging masonry surfaces. Provide cleaning product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units.
- K. Masonry Sealing Materials: Provide cleaning material manufacturer's compatible masonry sealer coating for all single wythe concrete masonry exterior walls. Specified products include: AquaSeal ME12 from Monopole Inc., www.monopoleinc.com/beta/pdf/5200.pdf.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, structure and installation conditions. Do not proceed with architectural concrete masonry work until unsatisfactory conditions have been corrected.
- B. Verify items provided by other Sections of work are properly sized and located.
- C. Verify that items to be built in are in proper location, and ready for roughing into masonry work.

- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean substrate surfaces thoroughly prior to installation.
- B. Establish lines, levels and coursing. Verify anchors and flashings are correctly located and installed.
- C. Furnish temporary bracing as required during installation of masonry work. Maintain in place until building structure provides permanent support.
- D. Do not wet concrete masonry units except as per TMS 402/602
- E. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint widths and to properly locate openings, movement type joints, returns and offsets. Whenever possible, avoid the use of less than half-size units at corners, jambs and other locations. Notify Design Professional when split masonry coursing at heads and sills of openings and cut concrete masonry coursing less than 4 inches in height not permitted.
- C. Lay up walls plumb and true to comply with specified tolerances. Provide square corners, except as otherwise indicated, with courses level, accurately spaced and coordinated with other work. Use double lines at multiple wythe walls.
- D. Pattern bond: Lay exposed concrete unit masonry in running bond with vertical joint in each course centered on units in courses above and below. Bond and interlock each course of each wythe at corners. Do not use units with less than 4 inches of horizontal face dimensions at corners or jambs. Install special shape units where indicated.
- E. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings, load bearing walls, all courses of piers, columns and pilasters and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. Maintain 3/8 inch nominal joint widths, except as necessary at first course bed joints, and except for minor variations required to maintain bond alignment
- F. Lay solid concrete masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints
- G. Compress and cut joints flush for masonry walls that are below grade, concealed or covered by other materials.
- H. Tool joints in all exposed masonry work to a concave joint when thumb print hard, unless plans indicate otherwise.
- I. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.
- J. Step back unfinished work adjoining new work. Rack back 1/2 unit length in each course; do not tooth. Clean exposed surfaces of set masonry and remove loose masonry units and

mortar before laying fresh masonry.

- K. Provide interlocking masonry bond in each course at corners and intersecting walls, unless otherwise indicated on plans such as for stack bond.
- L. Load-bearing walls: If carried up separately, provide rigid steel anchors spaced not more than 2 feet on center vertically. Embed ends in mortar filled cores. Build full height of story to underside of structure. Grout juncture with structure solid with grout.
- M. Non load-bearing walls: Build full height of story to underside of structure, except as otherwise shown. Terminate full height non load-bearing walls one joint thickness below the structure to allow for deflection of the structural element without loading the wall. Provide an open joint for application of joint sealant.
- N. [If Applicable:] Pre-installed two-piece, interlocking Concrete Masonry Unit Insulating Inserts:
 - 1. General: Inserts shall be pre-installed by CMU manufacturer prior to delivery to jobsite.
 - 2. Unless otherwise indicated on Construction Documents, inserts shall be left in place when grouting.
- O. As the work progresses, build in items specified under this and other Sections of the specifications. Fill in solidly with masonry around built-in items.
 - 1. Bed hollow metal frame anchors in mortar. Align anchors with joint coursing. Draw anchors tight and fill space between hollow metal frames and masonry solid with fine mortar grout.
 - 2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath or other approved material, in the joint below and rod grout into core.
 - 3. Provide solid masonry bearing for all lintels, beams, joists, plates and load-bearing members.
 - a. Provide solid masonry units or hollow units filled solid.
 - b. Minimum one block course under steel angle lintels and steel joists not bearing on bond beams.
 - c. Minimum two block courses under steel beams and steel beam lintels. Where beams and lintels are parallel with wall, extend solid bearing to walls, extend solid bearing 16 inches each side of centerline of beam.
 - 4. Take particular care to embed all conduits and pipes within concrete masonry without fracturing exposed shells and to fit units around switch, receptacle and other boxes set in walls. Where electric conduit, outlets, switch boxes and similar items occur, grind and cut units before building in services.
 - 5. Install anchors and reglets for flashing and related work built into masonry work.
 - 6. Install reinforcing steel and grout where indicated. Comply with Drawing details for reinforcing [steel size and spacing.
- P. Cavity walls:
 - 1. General: Maintain cavity clean of mortar droppings during construction. Strike joints facing cavity flush.
 - 2. Masonry walls: Tie exterior masonry veneer wythe to masonry back-up with adjustable metal ties secured to joint reinforcement built into masonry back-up walls or with individual metal ties secured to concrete masonry back-up.
 - 3. Concrete walls: Tie exterior masonry veneer wythe to concrete back-up with individual metal ties secured to dovetail anchor slots cast in concrete back-up.
 - 4. Space ties 16 inches on centers vertically and horizontally.
 - 5. Install cavity wall insulation as work progresses. Bond with adhesive to exterior face of interior walls. Seal vertical and horizontal joints with adhesive.
- Q. Veneer walls:

1. Masonry walls: Tie exterior masonry veneer wythe to masonry back-up with individual metal ties built into masonry back-up walls.
 2. Concrete walls: Tie exterior masonry veneer wythe to concrete back-up with individual metal ties secured to dovetail anchor slots cast in concrete back-up.
 3. Wood framed walls: Tie exterior masonry veneer wythe to back-up with individual metal ties nailed to wood stud wall framing.
 4. Metal framed walls: Tie exterior masonry veneer wythe to back-up with individual metal ties screwed to metal wall framing.
 5. Space ties 16 inches on center vertically and horizontally.
 6. Place horizontal joint reinforcing in the masonry veneer as follows:
 - a. For nominal 4" high concrete masonry veneer units, place the horizontal joint reinforcement at no greater than 12" vertical spacing.
 - b. For nominal 8" high concrete masonry veneer units, place the horizontal joint reinforcement at no greater than 16" vertical spacing.
- R. Single Wythe walls:
1. Lay masonry units with full head and bead joints.
 2. Tool both interior and exterior mortar joints
 3. Install all units with "Water Control Technology" (WCT) in proper, "up" position.
- S. Horizontal joint reinforcing: Joint reinforcing is specified in Section 04 05 19.29 - Stone Anchors. Install continuous joint reinforcing at all single wythe and back-up concrete masonry walls as follows:
1. In every second block course, 16 inches on center vertically, full height of wall and every block course where shown on the Drawings.
 2. In the first two bed joints immediately above and below all openings so that it extends a minimum of 24 inches beyond opening each way.
 3. In the bed joints of the first and second courses below the bearing line in bearing walls when wall receives uniformly distributed floor or roof loads in bed joints 16 inches below bond beams.
 4. In parapet walls 8 inches on center vertically, beginning at a point not less than 12 inches below the ceiling line of the heated space below the roof slab.
 5. Lap reinforcement a minimum of 6 inches and full width at corners and intersections or use special fabricated sections.
 6. Cut or interrupt joint reinforcement at vertical movement control or expansion joints, unless otherwise indicated.
 7. Prefabricated metal joint reinforcement shall not be used as wall ties in multiple wythe walls, except for composite wall construction and two adjacent tiers of concrete block.
 8. Fully embed side rods in mortar
- T. Anchor masonry to structural members where masonry abuts or faces such members to comply with the following:
1. Provide an open space not less than 1/2 inch width between masonry and structural member. Keep open space free of mortar or other rigid materials.
 2. Anchor masonry to structural members with metal ties embedded in masonry joints and attached to the structure. Provide anchors with adjustable tie sections. Space anchors not more than 24 inches on center vertically and 36 inches on center horizontally.
 3. Anchor veneers to concrete structural members with dovetail anchors.
- U. Control Joints: Provide control joints for exterior masonry construction.
1. Provide sash blocks with premolded shear key. Rake out mortar, if any, and form continuous vertical joints in masonry construction to receive joint sealant at the locations listed below.
 2. Locate control joints as indicated on the Drawings.
- V. Bond Beams: Install bond beams where indicated. Comply with Drawings for reinforcing

steel size and spacing. Fill bond beam masonry units solid with concrete fill or coarse mortar grout. Use smooth dowels to allow for horizontal movement at control joints unless otherwise indicated on the Drawings.

- W. Lintels:
1. Install loose steel lintels furnished under Section 05 50 00 - Metal Fabrications Metal Fabrications where shown. Set lintels in full bed of mortar.
 2. Provide minimum bearing at each jamb of 4 inches for openings for less than 6 feet and 8 inches for wider openings
- X. Flashing and weeps: Install flashing as specified in Section 07 62 00 - Sheet Metal Flashing and Trim or Section - .
1. Install concealed through wall masonry flashing at all cavity and veneer wall sills, masonry openings in exterior walls with masonry above head, over all horizontal steel members built into masonry and elsewhere as indicated. Comply with SMACNA "Architectural Sheet Metal Manual" Chapter 4 Flashing recommendations and with NCMA TEK Bulletins 19-4A and 19-5A details to ensure water resistant masonry construction.
 2. Install weeps in head joints of final course of exterior masonry wythe above flashing. Space weeps maximum of 24 inches on center horizontally with exterior ends and located to avoid door openings. Install weeps at head joints with outside face of weep material held 1/8 inch from the finish face of masonry unit.
 3. Install cavity fill on top of base flashing. Install a bed of mortar, conforming to the curve of the flashing, placed under the metal flashing.
 4. Install vents in head joints of final top course exterior masonry veneer wythe. Install at head joints with outside face of vent material held 1/8 inch from the finish face of masonry unit. Space vents 24 inches on center horizontally.
 5. Install compressible joint material at lintels and horizontal steel members. Build in joint fillers and seal with joint sealant specified in Section 07 90 00 - Joint Protection.

3.4 REINFORCED CONCRETE MASONRY

- A. Fill scheduled wall and column masonry work. Fill all cores solid with concrete fill/coarse masonry grout as specified in Section 04 05 16.26 - Engineered Masonry Grouting.
1. Grouting: Comply with TMS 602 grout placement requirements. Consolidate grout at time of placement.
 - a. Low-Lift Grouting: Place concrete fill/coarse masonry grout in maximum 5 foot vertical lifts.
 - b. High-Lift Grouting (If Approved): Place concrete fill/coarse masonry grout in maximum 12 foot vertical lifts (Recommend the use of super plasticizer with hi-lift grout).
 2. Recess top of grout fill minimum 1-1/2 inches below top of course to form a key with following lift.
 3. Where vertical reinforcing is required, install reinforcing before filling operation. Wet sticking of reinforcing is not permitted. Comply with Drawing details for reinforcing steel size and spacing.
- B. Install bond beams where indicated. Install reinforcing before filling operation. Fill units solid with grout. Comply with drawing details for reinforcing steel size and spacing.

3.5 REPAIR AND POINTING

- A. Clean and point exposed architectural concrete masonry at end of each working day. Remove and re- place masonry units that are loose, chipped, broken, stained, or otherwise damaged. Provide new units to match adjoining units and install in fresh mortar pointed to eliminate evidence of replacement.

- B. During the tooling of joints, enlarge any voids or holes, except weeps and completely fill with mortar. Point up all joints at corners, openings and adjacent work to provide a neat, uniform appearance. Remove line pins and fill all line pin holes.
- C. Wipe off excess mortar as the work progresses. Dry brush with bristle brushes exposed masonry at the end of each day's work. Remove mortar spatters and joint ridges.

3.6 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after, inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.7 CLEANING

- A. Cut out defective mortar joints and holes in exposed masonry and re-point with mortar of matching color and texture. Commence cleaning of the masonry walls as soon as the mortar is thoroughly set and cured. After mortar has cured for a period of 7 days (and no later than 14 days after completion of installation), the cleaning process can begin.
- B. Demonstrate the cleaning procedure on the sample panel at the job site prior to commencing cleaning on the building. When the sample panel is cleaned to the approval of the Architect, and the walls are complete, clean the building with the approved cleaning method.
- C. Protect adjacent and surrounding surfaces not intended to be cleaned from exposure to the cleaning chemical to prevent damage.
- D. Prevent cleaning chemical from coming into contact with people, motor vehicles, landscaping and other building materials that could be harmed by such contact. Follow Masonry cleaner Manufacturers' recommendations for personal protection.
- E. Clean the exposed masonry surfaces of stains, efflorescence, mortar, grout dropping and

debris using methods that do not damage the masonry. Do not use high pressure cleaning or aggressive scrubbing after cleaner application.

- F. The results of the cleaning process shall be inspected by the project Architect or authorized owner representative for acceptance after the walls have dried. For cleaning results to be accepted, the walls must comply with the standard set for the cleaning results on the sample panel, and the walls shall be free from mortar or efflorescence stains, and the color and texture of the finished walls shall not show damage, discoloration or staining from the cleaning process. If such damage or stains are present, then the walls must be cleaned and color corrected, as needed, to remove any such stains, discoloration or damage prior to the application of Coatings
- G. After cleaning allow units to dry and when specified apply a sealer as provided in Section 3.8.

3.8 COATING:

- A. After the results of the cleaning process have been fully accepted by the Architect, apply a colorless, non-staining, non-yellowing, breathable, penetrating water repellent. It shall be applied to the exterior exposed surface of the concrete masonry walls. Water-repellents must be capable of performing over hairline cracks and small voids less than 1/16". "Film Forming" Acrylic sealers will not be allowed. The water-repellent must not alter the color or texture of the wall after the material has fully cured. Follow manufacturer's application recommendations. Acceptable products include: AquaSeal ME12 from Monopole Inc., <http://www.monopoleinc.com/beta/pdf/5200.pdf>

3.9 PROTECTION

- A. Protect installed products until completion of project.
 - 1. Protect top of wall until covered or capped to a waterproof condition by subsequent construction.
 - 2. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that comes in contact with such masonry
 - 3. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
 - 4. Protect sills, ledges, and projection from mortar splatter and dropping.
 - 5. Protect surfaces of windows and door frames; as well as similar products with painted and integral finishes from mortar splatter and dropping
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION