

## SECTION 04 2000 - UNIT MASONRY

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### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes [single wythe concrete masonry walls] [and] [multi-wythe masonry consisting of concrete masonry back-up with [clay masonry veneer] [and] [concrete masonry veneer]:
1. Concrete masonry units (CMU)
  2. Masonry lintels
  3. Precast masonry lintels
  4. Precast concrete lintels
  5. Clay brick
  6. Concrete brick
  7. Mortar and grout
  8. Reinforcement
  9. Embedding flashing system
  10. Insulation
  11. Masonry accessories
  12. Cleaning

#### 1.02 RELATED REQUIREMENTS

- A. Section 01 3500 – LEED Credit Summary.
- B. Section 01 2100 – Allowances, for testing and inspection allowances, masonry unit allowances.
- C. Section 01 4000 – Quality Requirements.
- D. Section 01 4533 – Code-Required Special Inspections.
- E. Section 03 3000 – Cast-In-Place Concrete, for masonry-related embedments.
- F. Section 03 4500 – Precast Concrete, for lintels, sills, copings
- G. Section 04 7200 – Cast Stone.
- H. Section 05 4000 – Cold Form Metal Framing, for furring or framing at the inside face of the masonry wall.
- I. Section 05 5000 – Metal Fabrications, for steel lintels.
- J. Section 06 6100 – Rough Carpentry, for nailing strips and furring or framing at the inside face of the masonry wall.
- K. Section 07 1000 – Dampproofing and Waterproofing.
- L. Section 07 2500 – Weather Barriers, for air barrier.
- M. Section 07 9200 – Joint Sealants, for sealants and joint backing.
- N. Section 07 2100 – Thermal Insulation.

#### 1.03 REFERENCES

- A. Michigan Building Code (MBC) [2015] [2018]

- B. International Building Code (IBC) [2015] [2018]:
  - 1. Chapter 7 Fire Resistance Rated Construction.
  - 2. Chapter 14 Exterior Walls.
  - 3. Chapter 17 Special Inspections and Tests.
  - 4. Chapter 21 Masonry.
- C. TMS 602 Specification for Masonry Structures [2013] [2016].
- D. Mason Contractors Association of America (MCAA)
  - 1. Standard Practice for Bracing Masonry Walls Under Construction, December 2012
  - 2. The Masonry Wall Bracing Design Handbook, March 2003.
- E. National Concrete Masonry Association (NCMA):
  - 1. 3-1C All Weather Concrete Masonry Construction, Rev. 2002.
  - 2. 8-4A Cleaning Concrete Masonry, Rev. 2005.
- F. Brick Industry Association (BIA): Technical Notes on Brick Construction: 20 Cleaning Brickwork, August 2018.
- G. American Society for Testing and Materials (ASTM) (refer to IBC for dates of these standards):
  - 1. ASTM A36 Standard Specification for Carbon Structural Steel.
  - 2. ASTM A82 Standard Specification for Steel Wire, Plain for Concrete Reinforcement (Withdrawn 2013).
  - 3. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 4. ASTM A185 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
  - 5. ASTM A240 Standard Specification for Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - 6. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
  - 7. ASTM A641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
  - 8. ASTM A706 Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.
  - 9. ASTM A767 Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.
  - 10. ASTM A951 Standard Specification for Steel Wire for Masonry Joint Reinforcement.
  - 11. ASTM C55 Standard Specification for Concrete Building Brick.
  - 12. ASTM C67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2019.
  - 13. ASTM C90 Standard Specification Loadbearing Concrete Masonry Units.
  - 14. ASTM C126 Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
  - 15. ASTM C216 Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
  - 16. ASTM C270 Standard Specification for Mortar for Unit Masonry.

17. ASTM C476 Standard Specification for Grout for Masonry.
18. ASTM C516 Standard Specification for Vermiculite Loose Fill Thermal Insulation; 2019.
19. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
20. ASTM C549 Standard Specification for Perlite Loose Fill Insulation; 2018.
21. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
22. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
23. ASTM C744 Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
24. ASTM C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
25. ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete.
26. ASTM C1019 Standard Test Method for Sampling and Testing Grout.
27. ASTM C1104 Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
28. ASTM C1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
29. ASTM C1384 Standard Specification for Admixtures for Masonry Mortars.
30. ASTM C1405 Standard Specification for Glazed Brick (Single Fired, Brick Units).
31. ASTM C1611 Standard Test Method for Slump Flow of Self-Consolidating Concrete.
32. ASTM C1623 Standard Specification for Manufactured Concrete Masonry Lintels.
33. ASTM C1634 Standard Specification for Concrete Facing Brick.
34. ASTM D226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
35. ASTM D1056 Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.
36. ASTM D2000 Standard Classification System for Rubber Products in Automotive Applications.
37. ASTM D2287 Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.
38. ASTM E114 Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Contact Testing.
39. ASTM E136 Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degree C.

#### **1.04 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION**

- A. Dovetail anchor slots and reglets installed under Section 03 3000 – Cast-in-Place Concrete.

#### **1.05 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION**

- A. Section 03 4500 – Precast Architectural Concrete: Sill, lintel, trim, and coping.
- B. Section 05 5000 – Metal Fabrications: Loose Steel lintels, shelf angles, and Brickwork Support Lintel Systems.

- C. Section 04 7200 – Cast Stone Masonry: Sill, lintel, trim, and coping.
- D. Section 08 1100 – Hollow Metal Doors and Frames: Hollow Metal Doors and Frames.

#### 1.06 MASONRY PRE-CONSTRUCTION CONFERENCE

- A. Masonry Pre-Construction Conference Requirements.
  - 1. Schedule a Masonry Pre-Construction Conference at jobsite at approximately 3 weeks prior to start of masonry work at site.
  - 2. Submit required submittals to [Architect] [Engineer] [Architect-Engineer] and verify acceptance prior to this conference.
  - 3. [General Contractor] [Construction Manager] will prepare and issue minutes of meeting to team members.
  - 4. Do not proceed with masonry work without Masonry Pre-Construction Conference.
  - 5. Required participants include representatives from:
    - a. Owner.
    - b. [Architect] [Engineer] [Architect-Engineer].
    - c. [General Contractor] [Construction Manager.].
    - d. Project Superintendent.
    - e. Mason Contractor Foreman.
    - f. Structural Masonry Special Inspector.
    - g. Testing Agency.
- B. Agenda for Masonry Pre-Construction Conference:
  - 1. Review Contract Documents for Mason's clarifications, design intent, and Structural Masonry Special Inspector responsibilities. [Review Article 1.08 "Quality Assurance"] [Review Section 01 4000 "Quality Requirements"]
    - a. Verify use of up-to-date drawings/specifications.
    - b. Summary of Work for typical/atypical aspects of Project.
    - c. Contractor's concerns for missing/incomplete details.
    - d. Jobsite storage and staging areas.
    - e. Requirements for temporary facilities.
    - f. For each wall intersection, Engineer to identify one of following performance requirements:
      - 1) transfer no forces (expansion joint)
      - 2) transfer in-plane and out-of-plane forces (50 percent bonded units or strap anchors or reinforced bond beams)
      - 3) transfer out-of-plane forces from one wall to another only (mesh anchors or joint reinforcement)
    - g. Locations of concrete masonry control joints and clay brick masonry expansion joints.
    - h. Contractor's proposed methods for temporary wall bracing.
    - i. Erection schedule.
    - j. Coordination issues with other trades.

- k. Protection of non-masonry construction.
  - l. Integral water repellants and compatibility of mortar additive.
  - m. Mortar admixtures: water-repellent, set-retarding, set-accelerating, bond-enhancing, workability.
  - n. Mock-up/sample panel erection and review.
  - o. Cleaning and post-cleaning field-applied water repellants.
  - p. Open issues/concerns.
2. Review submittal status.
- a. Mortar type, proportions and mix design.
    - 1) Specific locations/applications for different mortars.
    - 2) Regional and recycled content credits (LEED®) or other green building rating programs.
  - b. Grout type, proportions and mix design.
    - 1) Specific locations/applications for different grouts.
    - 2) Regional and recycled content credits (LEED®) or other green building rating programs.
  - c. Manufacturer's literature for special requirements and conditions of use.
  - d. Joint reinforcement, including lap length and continuity at wall intersections.
  - e. Reinforcement shop drawings, including splice lengths, lateral ties, and stirrups.
  - f. Foundation dowel coordination drawing.
  - g. Temporary masonry wall bracing, (including lap splice lengths for internal wall bracing).
  - h. Lintels, door frames and other 'built-ins' materials status.
  - i. Shelf angle shop drawings.
  - j. Details of flashing and weeps.
  - k. Certificates of compliance.
  - l. Each type and size of anchor, tie, and metal accessory.
  - m. If required for project, Workshop Certificate(s) for flashing, grouting and cleaning masonry.
  - n. Masonry material cleaning plan.
3. Review material samples.
- a. Color ranges, textures, and finishes for masonry units exposed to view.
  - b. Dimensions of masonry units.
  - c. Mortar (pigmented).
4. Review results of specified pre-construction tests.
- a. Mortar and grout tests.
  - b. Masonry unit testing.
  - c. Prism testing (if required for project).

5. Review contractor's proposed cold and hot weather construction procedures.
6. Review masonry inspection and testing requirements during construction.
7. Review masonry cleaning plan.
8. Review/critique [Mock-up] [Sample] Panel.
  - a. Dimensions and adherence to tolerances.
  - b. Flashing and weep details.
  - c. Movement joint details.
  - d. Mortar joint finishing.
  - e. Bond pattern(s).
  - f. Mortar bedding.
  - g. Reinforcement and grouting.
  - h. Joint reinforcement and tie/anchor installation.
  - i. Lintel type and installation.
  - j. Air barrier and cavity insulation installation.
  - k. Workmanship.
  - l. Cleaning.
9. Review grout demonstration panel (if applicable).

#### **1.07 SUBMITTALS**

- A. Product Data: For each indicated product.
- B. Samples: For each type and color of masonry unit (including standard gray block) and pigmented mortar.
- C. Material Certificates:
  1. For each type of indicated product (including self-consolidating grout), include statement of properties, including fire ratings for masonry units, and compliance with these Specifications.
  2. Include mix design for mortar and grout.
  3. CMU manufacturer certified by water repellant manufacturer to produce water repellant CMU.
  4. Certification by CMU manufacturer CMU has been manufactured with integral water repellant at dosage rate proportioned per integral water repellant manufacturer's recommendations to achieve moisture control.
- D. Masonry Material Cleaning Plan: Include products and techniques for each masonry product of assembly and combined masonry assembly. Submit plan signed and approved by:
  1. General Contractor.
  2. Construction Manager.
  3. Mason Contractor.
  4. Masonry Unit Manufacturers.
  5. Cleaning Materials Supplier and Manufacturer.
  6. Cleaning Subcontractor.

- E. Construction procedures for cold weather and hot weather.
- F. Wall Bracing Plan showing braces and delineating restricted zones, for informational purposes only.
- G. Letters from manufacturers of air barrier, flashing, and insulation systems, indicating proposed materials are compatible with each other.
- H. Sustainability – Refer to Section 01 3500 – LEED Credit Summary.

#### **1.08 QUALITY ASSURANCE**

- A. Masonry Inspection and Testing: Refer to Project Drawings for applicable requirements.
- B. Conform to TMS 602 for masonry inspection and testing requirements.
- C. Ensure Field Technicians sampling, making, and curing specimens for acceptance testing are certified to National Concrete Masonry Association, Grade 1, or American Concrete Institute, Grade 1, or equivalent.
- D. Ensure Structural Masonry Special Inspectors are deemed qualified and competent by building official having jurisdiction.
- E. Pre-construction Testing: Owner will employ and pay for qualified independent masonry testing agency to perform following tests. Provide materials in reasonable quantities for testing:
  - 1. Grout: Compressive strength tests per ASTM C1019. Form grout specimens using units used for this project. Do not use cardboard forms unless written approval is obtained based on comparative preconstruction testing performed with units used for this project.
  - 2. Self-consolidating grout: Compressive strength tests per ASTM C1019 and slump flow and visual stability index (VSI) per ASTM C1611.
  - 3. Mortar Consistency: Mortar aggregate ratio tests per ASTM C780, Annex 4.
- F. Mock-Up Panels: Construct mock-up panels for each type of masonry construction for **[Architect's] [Engineer's] [Architect-Engineer's]** acceptance.
  - 1. Minimum size 48 inches wide by at least 48 inches high.
  - 2. Include: Back up wall, air barrier, air barrier laps and end dams, inside and outside corners, insulation, flashing and weeps, flashing laps and corner details, reinforcement, grout, window opening with steel lintel, masonry lintel, cleaning techniques, ties, anchors, mortar joint finishes, bond pattern, mortar bedding, and workmanship.
  - 3. Panels establish minimum quality for project.
  - 4. Remove rejected panels and reconstruct. Remove accepted free-standing panels upon completion and acceptance of masonry work. Accepted built-in panels may remain a permanent part of walls.
- G. Temporary Bracing: Design, provide, and install bracing will ensure stability of masonry during construction. For guidance, refer to “Standard Practice for Bracing Masonry Walls Under Construction” and “Masonry Wall Bracing Design Handbook”, published by The Mason Contractors Association of America. ([www.masoncontractors.org](http://www.masoncontractors.org)).

#### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer’s unopened packaging.
- B. Store aggregates where site drainage and soil will not contaminate aggregates.
- C. Store masonry units, cementitious materials and accessories on elevated platforms in dry location. Keep materials covered with weatherproof sheeting secured from wind. Minimize

condensation in shrinkage-wrapped pallets of units. Do not use saturated concrete masonry units as defined by NCMA TEK Note 3-1C.

### 1.10 PROJECT CONDITIONS

- A. Cold Weather Requirements: Implement cold weather procedures in compliance with TMS 602 and accepted submittal.
- B. Hot Weather Requirements: Implement hot weather procedures in compliance with TMS 602 and accepted submittal.

## PART 2 - PRODUCTS

### 2.01 CONCRETE MASONRY UNITS

- A. Load-Bearing Concrete Masonry Units (CMU):
  - 1. ASTM C90, [lightweight] [medium weight] [normal weight].
  - 2. Specified size: [ ] width by [ ] height by [ ] length. Specified size 3/8 inches less than nominal sizes.
  - 3. Compressive strength: [2000] [2650] [3400] [4350] [ ] psi.
  - 4. Color range: [Natural] [ ].
  - 5. Texture range: [standard] [smooth] [split-faced] [fluted] [scored] [striated] [ground-face (burnished)] [ribbed].
  - 6. For units exposed to weather, provide units made with integral water repellent admixture for moisture management.
  - 7. Provide special shapes for lintels, corners, jambs, sashes, movement joints, bond beams, and other special conditions indicated on drawings.
- B. Concrete Building Brick (not exposed to view):
  - 1. ASTM C55 [lightweight] [medium weight] [normal weight].
  - 2. Specified size: [ ] width by [ ] height by [ ] length. Specified size 3/8 inches less than nominal sizes.
  - 3. Compressive Strength: 2500 psi, minimum.
- C. Concrete Facing Brick: (exposed to view):
  - 1. ASTM C1634 [lightweight] [medium weight] [normal weight]
  - 2. Specified size: [ ] width by [ ] height by [ ] length. Specified size 3/8 inches less than nominal sizes.
  - 3. Compressive Strength: 3500 psi, minimum.
  - 4. Color range: [Natural] [ ].
  - 5. Texture range:
- D. Masonry Lintels: Field assembled CMU in color, pattern, size and texture matching adjacent CMU wall with reinforcing bars indicated on Drawings, placed and filled with grout.
- E. Precast Masonry Lintels: ASTM C1623 with reinforcing bars indicated on Drawings.

### 2.02 CLAY MASONRY UNITS

- A. General: Provide shapes indicated on drawings:
  - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide 100 percent solid units without cores or frogs and with



- exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
  3. Brick supplied shall be pre-blended by manufacturer.
- B. Facing Brick: ASTM C216, Grade SW, Type [FBX] [FBS] [FBA].
1. Efflorescence: Provide brick rated "not effloresced."
  2. Provide brick units from single runs and factory blended for specified color range.
  3. Surface Coating: Brick with colors or textures produced by application of organic coatings shall withstand 50 cycles of freezing and thawing per ASTM C67 with no observable difference in applied finish when viewed from 10 feet.
  4. Size (Specified Dimensions) for a 3/8 inch mortar joint:
    - a. [Modular: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.]
    - b. [Economy (Closure): 3-5/8 inches wide by 3-5/8 inches high by 7-5/8 inches long.]
    - c. [Utility: 3-5/8 inches wide by 3-5/8 inches high by 11-5/8 inches long.]
    - d. [Norman: 3-5/8 inches wide by 2-1/4 inches high by 11-5/8 inches long.]
    - e. [Meridian: 3-5/8 inches wide by 3-5/8 inches high by 15-5/8 inches long.]
    - f. [Ambassador: 3-5/8 inches wide by 2-1/4 inches high by 15-5/8 inches long.]

## 2.03 MORTAR AND GROUT MATERIALS

- A. Mortar:
1. Comply with ASTM C270, Type [S] [N] [M].
  2. [Use any cementitious materials permitted by ASTM C270.] [Do not use masonry cement or air-entrained portland cement and lime in cementitious materials when masonry is partially grouted and structure is in Seismic Design Category D, E, or F.]
  3. Color: [Standard Gray], [White], [Mineral pigment in compliance with ASTM C979 and with a record of satisfactory performance in masonry mortar].
  4. Admixtures: Comply with ASTM C1384 to enhance following property(ies): [water repellency] [set retarding] [set accelerating] [bond] [workability]. Provide water-repellent admixture manufactured by same manufacturer of water-repellent admixture used in concrete masonry units.
  5. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce selected color. Do not add pigments to colored cement products. Comply with TMS 602 Article 2.6 A.2 for maximum permitted amount of pigments.
- B. Grout:
1. Comply with ASTM C476.
  2. Admixtures:
    - a. Do not use admixtures other than those permitted by ASTM C476 or those permitted by [Architect] [Architect/Engineer] [Engineer].
    - b. Do not use water-repellent materials or admixture or air-entraining admixture when grout will be in contact with reinforcement.

## 2.04 REINFORCEMENT

JOB NO. XXXX

04 2000 - 9

UNIT MASONRY

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- A. Deformed Steel Reinforcing Bars: ASTM A615, or ASTM A706, or ASTM A767, Grade 60.
- B. Masonry Joint Reinforcement: ASTM A951.
  - 1. Size: [Standard: W1.7 longitudinal and cross wires] [Heavy-duty: W2.8 longitudinal wires and W1.7 cross wires where indicated on Drawings].
  - 2. Spacing of cross wires: 16 inches on center.
  - 3. Corrosion Protection in exterior walls [and swimming pool, spa, and other high humidity spaces (mean relative humidity exceeding 75 percent)]: carbon steel, hot-dip galvanized, ASTM A153 Class B-2 (1.50 ounces per square foot).
  - 4. Corrosion protection in interior walls: carbon steel, mill galvanized, ASTM A641 (0.10 ounces per square foot).
  - 5. Corrosion protection in chemical storage room walls: Stainless steel, ASTM A580 Type 304 or carbon steel, hot-dip galvanized ASTM A153 Class B-2.
  - 6. Type for Single-Wythe Masonry: Ladder type with single pair of longitudinal wires spaced for placement over each face shell.
  - 7. Type for Multi-Wythe Masonry: Ladder type with single pair of longitudinal wires spaced for placement over each face shell, with "eyes" to receive pintle anchors butt welded next to one of longitudinal wires. Engage double pintle anchors in eyes" of joint reinforcement with sufficient length to extend minimum 1-1/2 inches into veneer with minimum 5/8 inch cover to exterior face.

## 2.05 EMBEDDED FLASHING SYSTEM MATERIALS

- A. Flexible Membrane Flashing: Provide one of following:
  - 1. [Copper Fabric Flashing non-asphaltic: 5 ounce per square foot copper bonded to 2 layers of polymer fabric.]
  - 2. [Rubberized-Asphalt Flashing: Composite bonded flashing product of a rubberized-asphalt adhesive compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.]
  - 3. [Elastomeric Thermoplastic Flashing: Composite of rubberized-asphalt adhesive, 0.025 inch thick, bonded to a polyester-reinforced ethylene interpolymer alloy.]
  - 4. [EPDM Flashing: Ethylene-propylene-diene terpolymer, 0.040 inches thick.]
  - 5. [Stainless Steel Fabric flashing: 2 mil type 304 stainless steel laminated on back with polymer fabric and outward facing side, clean stainless steel face.]
  - 6. [Self-Adhering Stainless Steel: 2 mil type 304 stainless steel bonded to butyl adhesive to create clean stainless steel face outward layer and butyl adhesive inward layer.]
  - 7. [Adhesives, Primers, Sealants, and Seam Tapes for Flexible Membrane Flashing System: Provide products recommended by membrane flashing manufacturer.]
- B. Metal Drip Edge: ASTM A240, Type 304, stainless steel, 0.0156 inches thick.
  - 1. Metal Configuration: Except near grade, extend at least 3 inches horizontally into masonry and 3/4 inch out from exterior face of masonry with outer edge bent down 45 degrees and hemmed. Near grade, extend at least 3 inches horizontally into masonry and outer edge bent down 45, 90, or 180 degrees and hemmed.
  - 2. Sealant Between Layers of Sheet Metal: One-part non-skinning butyl sealant.

- C. Weeps: Provide one of following:
1. [Fully Open Head Joint.]
  2. [Partially Open Head Joint.]
  3. [Mesh Weep: Free-draining polyethylene strand mesh, masonry unit height and depth by 3/8 inch wide. Color to match mortar.]
  4. [Cellular Plastic Weep: One-piece, flexible extrusion made of UV-resistant polypropylene copolymer, masonry unit height and depth by 3/8 inches wide. Color to match mortar.]
  5. [Louvered Weep: T-shaped of flexible PVC. Color to match mortar.]
  6. [Cotton Rope Wick: Extend from face of masonry to interior drainage cavity 6 inches above horizontal leg of masonry flashing.]
- D. Termination Bars: [Stainless steel] [Aluminum], 1/8 inch thick by 1-1/4 inch.
- E. Single Wythe Pan Flashing System for Single Wythe CMU:
1. Material: High-density polyethylene incorporating chemical stabilizers.
  2. Configuration: Pans with weep spouts extending from center of pan to outside face of masonry and connector bridges.
  3. Seven inch by 14 inch drainage mats made of 90 percent open weave polyester mesh for insertion into masonry cores above pan.
- F. Cavity Drainage Material:
1. Free-Draining Mesh: polyethylene woven strands, dovetail shape, designed to catch mortar droppings and prevent weep holes from being clogged.

## 2.06 INSULATION MATERIALS

- A. Insulation for Cavity:
1. Extruded-Polystyrene Board Insulation (EXP): ASTM C578, closed-cell product extruded with an integral skin; Type IV or Type X: Minimum R-value of 5.0 per 1 inch thickness at 75 degrees F mean temperature.
  2. Mineral Fiber Batt Insulation: ASTM C665, Unfaced, flexible preformed batt or blanket, friction fit in compression with adjacent material and mechanically fastened.
    - a. Thermal Resistance: Minimum R-value of 4.3 per inch when tested in accordance with ASTM C518.
    - b. Moisture Resistance: Maximum absorption: 0.03 percent by volume when tested in accordance with ASTM C1104.
    - c. Rated Non Combustible as defined by NFPA Standard 220 when tested in accordance with ASTM E136.
  3. Polyisocyanurate: (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
    - a. Type I: Faced with aluminum foil on both major surfaces of core foam.
    - b. Class 1 - Non-reinforced core foam.
    - c. Compressive Strength: 16 psi, minimum.
    - d. Thermal Resistance, R-value: At 1-1/2 inch thick; not less than 5.0 at 75 degrees F.
  4. Closed Cell Spray Foam: ASTM D1622.
    - a. Core Density: 2.0 pound per cubic foot, minimum.

- b. Thermal Resistance: 6.5 R, minimum, per inch.
  - c. Compressive Strength: 27 pounds per square inch, minimum; ASTM D 1621.
  - d. Smoke Burning Characteristics: ASTM E 84 at 4 inches.
    - 1) Flame Spread Index: Less than or equal to 25.
    - 2) Smoke development Index: Less than or equal to 450.
- B. Insulation for CMU Cells: Provide one of following:
- 1. Loose Granular Fill Insulation: Provide granular asphalt coated vermiculite loose-fill insulation in accordance with ASTM C516, Type II or perlite loose-fill insulation in accordance with ASTM C549, Type II (surface treated for water repellency and moisture absorption).
  - 2. Expanded Polystyrene Insulation Inserts: Individually molded to fit CMU core profile, 1.0 pounds per cubic foot minimum density and maximum water vapor transmission of 1.4 perm inch, and conforming to ASTM C578.

## 2.07 MASONRY ACCESSORIES

- A. Preformed CMU Control Joint:
- 1. Extruded polyvinyl chloride complying with ASTM D2287 or extruded styrene-butadiene rubber compound complying with ASTM D2000, AA805.
  - 2. Cross shape shear key with minimum 1/4 inch thick flanges.
- B. Expansion Joint Filler and Compressible Filler:
- 1. Closed cell rubber complying with ASTM D1056, Class 2A1.
  - 2. Size: Minimum thickness no less than joint opening by 3 inches wide by maximum lengths available.
- C. Connections at wall intersections required to transfer in-plane and out-of-plane forces: Provide rigid Z-Strap anchors only when intersection does not have 50 percent of masonry units overlapped and does not have reinforced bond beams. Fabricate anchors from ASTM A36 steel, 1-1/2 inches wide by 1/4 inch thick by 24 inches long with ends turned up 2 inches (total 28 inches in length).
- D. Connectors at wall intersections required to transfer out-of-plane forces from one wall to another only: Provide welded wire mesh anchors fabricated from 1/2 inch by 1/2 inch mesh of wire size W0.3 or 1/4 inch by 1/4 inch mesh of wire size W0.06 in width 2 inches less than nominal thickness of masonry wythe and length not less than twice the thickness; ASTM A185 wire with hot-dip galvanizing per ASTM A153 Class B-2.
- E. Connections from masonry to structural frame: Provide flexible anchors consisting of two components as follows:
- 1. Receiver Component: 1/4 inch diameter carbon steel rod with 3/8 inch offset or 12 gauge carbon steel straps with 4 inch adjustment for triangular anchors; galvanized per ASTM A641 (0.10 ounces per square foot).
  - 2. Triangular Anchors: 3/16 inch diameter steel wire, ASTM A82 with closed end minimum 1 inch wide and split-end opening no more than 1/2 inch. Hot-dip galvanized, ASTM A153 Class B-2 (1.5 ounces per square foot, carbon steel). Extend anchor at least 1-1/2 inches into masonry wythe but with at least 5/8 inch cover on outside face.
- F. Bond-Breaker Material: Asphalt saturated, organic roofing felt complying with ASTM D226, Type I (No. 15 asphalt felt). Grout Retainer: Mesh screen, width 1 inch less than masonry unit

width. Use at bottom of open bottom unit to retain grout without use of special shaped CMUs and without breaking mortar bond.

- G. Post-Cleaning Field-Applied Water Repellant: Concrete Masonry Unit manufacturer's recommended water repellant, compatible with integral water repellant.
- H. Masonry Cleaners: Proprietary cleaner(s) recommended by masonry material manufacturer(s) for each type of masonry surface and identified in approved Masonry Material Cleaning Plan.
- I. Sealant and Backings: Refer to Section 07 9200 – Joint Sealants.

## 2.08 MORTAR AND GROUT MIXES

- A. Mortar Mix: ASTM C270, Proportion Specification.
  - 1. Type M or S for masonry below grade or in contact with earth.
  - 2. Type S for unreinforced masonry above grade.
  - 3. Type [N] [S] for reinforced masonry above grade.
  - 4. Type N for veneer masonry.
  - 5. Admixtures: Permitted admixtures are specified in Article 2.03 A.4. If admixture is used, add at consistent rate for exposed mortar to ensure consistent mortar color, regardless of weather. Test for compatibility with other products and assemblies.
  - 6. Mix mortar in accordance with TMS 602 Article 2.6 A.
- B. Grout Mix: ASTM C476
  - 1. Minimum compressive strength at 28 days: [2000] [2650] [3400] [4350] [ ] psi when tested in accordance with ASTM C1019
  - 2. Provide fine or coarse grout per TMS 602 Table 7, Grout Space Requirements, based upon masonry pour height (height of constructed masonry) and size of grout space.
- C. Self-Consolidating Grout Mix: Conform to ASTM C476.
  - 1. Provide fine or coarse self-consolidating grout.
  - 2. Minimum compressive strength at 28 days: [2000] [2650] [3400] [4350] [ ] psi when tested in accordance with ASTM C1019.
  - 3. Slump flow of 24 to 30 inches per ASTM C1611.
  - 4. Visual Stability Index (VSI) less than or equal to one per ASTM C1611, Appendix X.1.
  - 5. Jobsite proportioning of self-consolidating grout is NOT PERMITTED.
  - 6. Field addition of water and admixtures is NOT PERMITTED unless acceptable to manufacturer.
  - 7. Field addition of admixtures is NOT PERMITTED.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Inspect concrete foundations for compliance with tolerances of TMS 602, and verify reinforcing dowels are positioned in accordance with Drawings.
- B. Concrete Foundation and Masonry Foundation Wall Discrepancies:
  - 1. Notify Architect-Engineer [and] [General Contractor] [Construction Manager] in writing of discrepancies.
  - 2. Do not proceed with masonry work until conditions have been corrected.

### 3.02 PREPARATION

- A. Prepare foundation surface for adequate masonry bond.
- B. Do not wet concrete masonry units before placing. Wet cutting is permitted.
- C. Wet clay masonry units having initial rate of absorption (IRA) in excess of 1 g per minute per square inch (equivalent to 30 g per minute on modular brick bedding surface); saturate and permit to surface dry before laying. Do not wet clay masonry units with IRA less than 0.2 g per minute per square inch (equivalent to 5 g per minute on modular brick bedding surface).
- D. Prior to grouting, ensure grout spaces are free of mortar dropping, debris, loose aggregates, and any material deleterious to masonry grout, then place reinforcement.
- E. Provide cleanouts in walls to be grouted when height of constructed wall exceeds 5 feet 4 inches in height. Locate cleanouts at each vertical reinforcing bar or maximum 32 inches on center when fully grouting.

### 3.03 PROTECTION

- A. Protect non-masonry adjacent surfaces during construction.
- B. Without damaging completed work, provide protective boards at exposed external corners subject to damage by construction activities.
- C. Protect sills, ledges, and projections from mortar droppings. Protect base of wall from mortar and mud splashes.
- D. Replace damaged and defective work at no cost to Owner.
- E. Patched masonry units will not be accepted in units exposed to view, unless written acceptance is obtained from [Architect] [Architect/Engineer] [Engineer].
- F. Upon completion, ensure Work is in proper condition to receive succeeding work.

### 3.04 PLACEMENT – GENERAL

- A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying. Install cut units with cut surfaces concealed.
- B. 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.
- C. Place masonry units in single-wythe walls and in back-up wythe of multi-wythe walls in running bond pattern unless otherwise noted.
- D. Unless otherwise indicated, place masonry veneer in [one-half running bond] [stack bond] [one-third running bond] [one-quarter running bond] [other].
- E. Do not use units with less than nominal 4 inch horizontal face dimensions at corners and jambs.
- F. Construct 3/8 inch (plus or minus 1/8 inch) mortar bed joints when masonry units are compressed onto mortar, except at foundation. At foundation, construct mortar bed joints are not less than 1/4 inch and not more than 3/4 inch for ungrouted and partially grouted masonry and not more than 1-1/4 inch for solid grouted first course of masonry on a concrete foundation.
- G. Construct 3/8 inch (minus 1/4, plus 3/8 inch) mortar head joints when masonry units are shoved into mortar.

- H. Mortar Bedding and Jointing:
1. Lay hollow units with face shells fully bedded in mortar and with head joints of depth equal to bed joints. Also, fully mortar cross webs where cells are to be grouted, unless all cells are grouted, and where cells are to be filled with loose fill insulation.
  2. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- I. Tool mortar joints to a concave profile, using a jointer larger than joint thickness, on exposed interior face of wall and exterior exposed face when mortar is thumbprint hard. Strike mortar joints flush on exterior (cavity) face of backup wythe.
- J. Remove mortar joint protrusions extending 1/2 inch or more into CMU cells to be grouted.
- K. Retempering of non-colored mortar is permitted. [Retempering of colored mortar is not permitted.]
- L. Wall Intersections: Engineer's requirements are identified as described in Article 1.06 B.1.f.
1. Provide an expansion joint at wall intersections for which Engineer has indicated no forces are to be transferred.
  2. Provide mesh anchors over grouted cells or continuous joint reinforcement at maximum 16 inches on center at wall intersections for which Engineer has indicated out-of-plane forces must be able to be transferred from one wall to another.
  3. Provide overlapping masonry units in each course or strap anchors a maximum 4 feet on center or reinforced bond beams at maximum 4 feet on center at wall intersections for which Engineer has indicated both in-plane and out-of-plane forces must be transferred.
  4. Do not tooth masonry at wall intersections unless written acceptance is obtained from [Architect] [Architect/Engineer] [Engineer]; rack back if units will be overlapped at intersection.
- M. Install connectors, and other accessories.
1. Embed veneer anchors 1/2 inch in outer face shell of hollow veneer units and 1-1/2 inches in solid veneer units.
  2. Place connectors in accordance with sizes, types, and locations indicated.
- N. Brace masonry walls to meet requirements of MIOSHA Construction Safety Standards, Part 2. Masonry Wall Bracing. Refer to MCAA publications and MIOSHA Construction Fact Sheet: Bracing Tall Masonry Walls for more information ([http://www.michigan.gov/documents/cis/wsh\\_constfact\\_masonry\\_180828\\_7.htm](http://www.michigan.gov/documents/cis/wsh_constfact_masonry_180828_7.htm)).
- O. Erect masonry to meet tolerances of TMS 602.
- P. Construct movement (expansion and control) joints where indicated on Drawings. Terminate horizontal reinforcing on each side of movement joint. Provide continuous or discontinuous reinforcement at movement joints through bond beams as detailed on Drawings.
- Q. Solidly fill cells below lintel and beam bearing as noted on Drawings.
- R. Keep masonry surfaces clean during construction. Remove mortar drippings, tags, and stains before mortar cures. Use light brush sweep with a soft brush across exposed masonry surfaces upon initial mortar set to minimize smearing. Prevent grout from staining face of masonry. Immediately remove and clean grout spills. Remove mortar build-up from scaffold and turn over planks to avoid mortar splashes when not working.
- S. Cover tops of masonry walls at completion of each day's work whenever possible. Maintain

covering to minimize water and debris intrusion into ungrouted cells until permanent closure at top of walls is complete.

- T. Tooth masonry infills into adjacent masonry. At edges of openings to be reworked, remove existing bullnose units and replace with stretcher units toothed into existing masonry.

### 3.05 REINFORCEMENT

- A. Place reinforcing bars in accordance with sizes, types, spacing, and locations indicated.
1. Provide lap splices of minimum length indicated or splice bars with mechanical couplers. When accepted in writing, splice bars by welding.
  2. Permit in-place reinforcement to be inspected before placing grout.
- B. Secure bar reinforcement to prevent displacement during placement of grout and meet the following tolerances:
1. Maintain a clear distance between reinforcement and unit cell wall of at least 1/4 inch for fine grout and 1/2 inch for coarse grout.
  2. Place reinforcing bars within spacing and location tolerances of TMS 602.
- C. Joint Reinforcement: Place joint reinforcing in bed joints of concrete masonry at not more than 16 inches on center vertically, and place in additional locations where indicated.
1. Locate joint reinforcement so longitudinal wires are embedded in mortar, including wires within lap length. Place cross wire over webs of hollow units (16 inches on center).
  2. Provide minimum lap length of joint reinforcement of 8 inches.
  3. Do not extend joint reinforcement through movement joints.
  4. In multi-wythe walls of concrete masonry backing and concrete masonry veneer, use separate continuous horizontal joint reinforcement in each wythe.
  5. Place joint reinforcement with at least 5/8 inch mortar cover when exposed to weather or earth and 1/2 inch when not exposed.

### 3.06 GROUT PLACEMENT

- A. Comply with consolidation requirements and grout pour height and grout lift height limitations of TMS 602, unless a grout demonstration panel is submitted and accepted by [Architect] [Architect/Engineer] [Engineer].
- B. Placement Time:
1. Place conventional grout within 1-1/2 hours from mixing and prior to initial set of grout.
  2. Ready-mixed grout may be placed after 1-1/2 of adding water at time of discharge only if specified slump is met without addition of more water.
- C. Grout Consolidation:
1. Consolidate grout pours 12 inches or less in height by mechanical vibration or by puddling.
  2. Consolidate pours exceeding 12 inches in height by mechanical vibration, and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.
  3. Consolidation and reconsolidation are not required for self-consolidating grout.
- D. Grout Key - When grouting, form grout keys between grout pours. Form grout keys between grout lifts when first lift is permitted to set prior to placement of subsequent lift.
1. Form grout key by terminating grout minimum of 1-1/2 inches below mortar joint.
  2. Do not form grout keys within beams or lintels.



3. At beams or lintels laid with closed bottom units, terminate grout pour at bottom of beam or lintel without forming grout key.
- E. Bond Beams and Masonry Lintels.
1. Grout multi-course beams and lintels in single lift.
  2. Allow bond beams and masonry lintels to attain sufficient strength to support loads imposed during construction before removing temporary supports.

### 3.07 FLASHING SYSTEM

- A. Install flashing on clean, solid and undamaged surface. Provide flashing at locations indicated on Drawings. Form end dams, 2 inches high, at horizontal terminations of flashings. Mechanically fasten vertical leg of flashing at backup by continuous termination bar with sealant applied at bar's top edge. Ensure both vertical and horizontal legs of flashing are continuous at corners. Lap flashings a minimum of 4 inches and seal as recommended by flashing manufacturer and as follows.
1. Provide 2 continuous beads of non-skinning butyl sealant between sheets of lapped sheet metal flashing and sheet metal drip edges.
  2. Roll laps in self-adhering flashing, leaving no fish-mouths, and apply manufacturer's mastic at exposed cut edges.
- B. Terminate outside horizontal edge of flashing as follows or as detailed on Drawings.
1. At lintels and shelf angles, install metal drip edges with 45-degree hemmed drips beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of masonry and adhere flexible flashing to top of metal drip edge. Apply sealant below 45 degree hemmed edge.
  2. At base of wall, terminate non UV-sensitive flexible flashing flush with exterior face of masonry with no metal drip edge and fully bed flashing in non-asphaltic mastic or adhesive or non-skinning butyl sealant. Install flashing so it protrudes from face of masonry and cut it flush after review by [Architect] [Architect/Engineer] [Engineer]. Alternatively, use metal drip edge with 180-degree bend with any flexible flashing. Adhere flashing to drip edge and fully bed drip edge in non-asphaltic mastic or adhesive or non-skinning butyl sealant.
- C. Install weeps and cavity drainage material directly on top of horizontal leg of flashing in clean cavity.
- D. Install flashing systems in accordance with manufacturers published installation instructions.

### 3.08 CAVITY WALLS

- A. Connect wythes of cavity walls using horizontal joint reinforcement with adjustable ties to allow for differential movement.
- B. Keep cavities clean of mortar droppings and other materials during construction. Batter mortar beds away from cavity to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- C. Installing Cavity-Wall Insulation: Fit insulation between wall anchors and other confining obstructions, with edges butted tightly. Press units firmly against inside back-up wythe of masonry. Fasten insulation to inside wythe following manufacturer's recommendations.

### 3.09 BUILT IN WORK

- A. As work progresses, install built-in metal door frames, window frames, loose steel lintels, shelf angles, brickwork support lintel system, and other items to be built into work and furnished

under other sections. Fill in solidly with masonry around built-in items.

- B. Install built-in items plumb, level, and true-to-line.
- C. Coordinate installation of mechanical, plumbing, and electrical components furnished by others.
- D. Do not cut masonry to accommodate installations afterward

### **3.10 FIELD QUALITY CONTROL**

- A. Provide a Masonry Foreman to oversee Work and assure consistent work quality.
- B. Assist Masonry Testing Agency with sampling of materials required to be tested per Article 1.08.
- C. Assist Structural Masonry Special Inspector with performing inspections required by Article 1.08.

### **3.13 MASONRY CLEANING**

- A. Using materials per approved cleaning plan, demonstrate cleaning methods on mockup or on an inconspicuous area of new masonry to determine suitability of cleaning materials and methods.
- B. Before cleaning masonry, protect other masonry and other non-masonry surfaces to prevent damage
- C. Use cleaning procedures. Do not damage finished masonry.
- D. Clean clay masonry in accordance with BIA Technical Notes 20.
- E. Clean exposed concrete masonry in accordance with NCMA TEK 8-4A.

### **3.14 CLEAN UP**

- A. Remove freestanding mock-up panels upon completion and acceptance of masonry Work.
- B. Remove masonry-related debris and properly dispose of offsite.
- C. Leave site in broom-clean condition.

**END OF SECTION**