

**DIVISION 04**

**MASONRY**

## SECTION 04820

### REINFORCED UNIT MASONRY ASSEMBLIES

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Concrete Block.
- B. Clay Facing Brick.
- C. Mortar and Grout.
- D. Reinforcement and Anchorage.
- E. Flashings.
- F. Lintels.
- G. Accessories.

##### 1.02 RELATED SECTIONS

- A. Section 03200 - Concrete Reinforcement: Reinforcing steel for grouted masonry.
- B. Section 06100 - Rough Carpentry: Nailing strips built into masonry.
- C. Section 07900 - Joint Sealers: Backing rod and sealant at control and expansion joints.

##### 1.03 REFERENCES

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International.
- C. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A 580/A 580M - Standard Specification for Stainless Steel Wire.
- F. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- G. ASTM A 641/A 641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- H. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.
- I. ASTM A 706/A 706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
- J. ASTM C 55 - Standard Specification for Concrete Brick.
- K. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

- L. ASTM C 90 - Standard Specification for Load-bearing Concrete Masonry Units.
- M. ASTM C 91 - Standard Specification for Masonry Cement.
- N. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.
- O. ASTM C 126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
- P. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units.
- Q. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
- R. ASTM C 150 - Standard Specification for Portland Cement.
- S. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- T. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale).
- U. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- V. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout.
- W. ASTM C 476 - Standard Specification for Grout for Masonry.
- X. ASTM C 744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
- Y. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- Z. ASTM C 1019 - Standard Test Method of Sampling and Testing Grout.
- AA. ASTM C 1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength.
- AB. ASTM C 1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
- AC. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- AD. ASTM E 447 - Standard Test Method for Compressive Strength of Laboratory Constructed Masonry Prisms.
- AE. ASTM E 518 - Standard Test Methods for Flexural Bond Strength of Masonry.
- AF. AWS D1.4 - Structural Welding Code - Reinforcing Steel; American Welding Society.
- AG. IMIABC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council.
- AH. IMIABC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council.
- AI. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.
- AJ. Use the latest issue of the above reference standards as of the date of the Project.

#### **1.04 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar and grout.

- C. Shop Drawings: Indicate bar sizes, spacing, reinforcement quantities, bending and cutting schedules, reinforcement supporting and spacing devices, and accessories.
- D. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range, where required by the Engineer.
- E. Design Data: Indicate required mortar strength, unit assembly strength in each plane, and supporting test data.
- F. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

### **1.05 QUALITY ASSURANCE**

- A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.
  - 1. Maintain one copy of each document on project site.

### **1.06 REGULATORY REQUIREMENTS**

- A. Conform to applicable requirements of the Uniform Building Code.
- B. Conform to applicable requirements of the City of Saratoga Springs.

### **1.07 PRE-INSTALLATION MEETING**

- A. Convene one week before starting work of this section for each building.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Handle and store ceramic glazed masonry units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

### **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Cold Weather Requirements: Comply with recommendations of IMIAWC (CW).
- B. Hot Weather Requirements: Comply with IMIAWC (HW).

## **PART 2 PRODUCTS**

### **2.01 CONCRETE MASONRY UNITS**

- A. Concrete Block: Comply with referenced standards and as follows:
  - 1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
  - 2. Load-Bearing Units: ASTM C 90.
    - a. Hollow block, as indicated.
    - b. Type I: Moisture-controlled; lightweight.
    - c. Exposed faces: Manufacturer's standard color and texture where indicated.
  - 3. Pre-Faced Units: ASTM C 90, Type I, hollow block, with smooth resinous facing complying with ASTM C 744.
    - a. Colors and styles: As indicated on drawings.

## 2.02 BRICK UNITS

- A. Facing Brick: ASTM C 216, Type FBS, Grade SW.
  - 1. Color and texture to match Engineer 's sample.
  - 2. Compressive strength: As indicated on drawings, measured in accordance with ASTM C 67.

## 2.03 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C 91 Type N.
  - 1. Colored mortar: Premixed cement as required to match Engineer 's color sample.
- B. Portland Cement: ASTM C 150, Type I; color as required to produce approved color sample.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Mortar Aggregate: ASTM C 144.
- E. Grout Aggregate: ASTM C 404.
- F. Water: Clean and potable.
- G. Accelerating Admixture: Non-chloride type for use in cold weather.
- H. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

## 2.04 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (300).
  - 1. Deformed billet-steel bars.
  - 2. Unfinished.
- B. Reinforcing Steel: ASTM A 706/A 706M, deformed low-alloy steel bars.
  - 1. Unfinished.
- C. Single Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, mill galvanized to ASTM A 641/A 641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
  - 1. Manufacturers:
    - a. Dur-O-Wal, Inc.
    - b. Hohmann & Barnard, Inc.
    - c. Substitutions: See Section 01600 - Product Requirements.
- D. Multiple Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
  - 1. Manufacturers:
    - a. Dur-O-Wal, Inc.
    - b. Hohmann & Barnard, Inc.
    - c. Substitutions: See Section 01600 - Product Requirements.
- E. Strap Anchors: bent steel shape, of size recommended by the manufacturer, hot dip galvanized to ASTM A153/A, Class B-2.

- F. Wall Ties: Corrugated formed sheet metal, of size recommended by the manufacturer, adjustable, hot dip galvanized to ASTM A 153/A, Class B-2.

## **2.05 FLASHINGS**

- A. Pre-Coated Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 coating, 26 gauge thickness, shop pre-coated with fluoropolymer coating in color matching masonry.
- B. Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 coating, 26 gauge thickness.
- C. Lap Sealant: Butyl type as specified in Section 07900.

## **2.06 ACCESSORIES**

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
- B. Building Paper: ASTM D 226, Type I ("No. 15") asphalt felt.
- C. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
- E. Vermiculite Fill: granular, exfoliated vermiculite; comply with FS HH-I-585, Type 1 or 2; Zonolite Masonry Fill, or acceptable equal.

## **2.07 LINTELS**

- A. Concrete Block Lintels: Construct with concrete masonry units as indicated on drawings.

## **2.08 MORTAR MIXES**

- A. Ready Mixed Mortar: ASTM C 1142, Type RM.
- B. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.
  - 1. Engineered masonry: Type S.
  - 2. Masonry below grade and in contact with earth: Type S.
  - 3. Exterior, load-bearing masonry: Type S.
  - 4. Interior, load-bearing masonry: Type S.
- C. Colored Mortar: Proportion selected pigments and other ingredients to match Engineer's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

## **2.09 MORTAR MIXING**

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C 270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.
- D. Do not use anti-freeze compounds to lower the freezing point of mortar.
- E. If water is lost by evaporation, re-temper only within two hours of mixing.

- F. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

## **2.10 GROUT MIXES**

- A. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94.
  - 1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
  - 2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- B. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94.
  - 1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
  - 2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

## **2.11 GROUT MIXING**

- A. Mix grout in accordance with ASTM C 94.
- B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C 476 for fine and coarse grout.
- C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- D. Do not use anti-freeze compounds to lower the freezing point of grout.

## **2.12 PRECONSTRUCTION TESTING**

- A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01400.
- B. Concrete Masonry: Test each type, class, and grade of concrete masonry unit in accordance with ASTM C 140.
- C. Mortar Mixes: Test mortars pre-batched by weight in accordance with ASTM C 780 recommendations for preconstruction testing.
- D. Grout Mixes: Test grout batches in accordance with ASTM C 1019 procedures.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

### **3.02 PREPARATION**

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Clean reinforcement of loose rust.

- C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- D. For areas where high-lift grouting will be employed, provide cleanout openings as follows:
  - 1. Brick Masonry: Not less than 8 inches on center at the bottom of one wythe, formed by omitting bricks.
  - 2. Hollow Masonry: Not less than 8 inches high at the bottom of each cell to be grouted, formed by cutting out face shell of masonry unit.

### **3.03 COURSING**

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
  - 1. Bond: Running.
  - 2. Coursing: One unit and one mortar joint to equal 8 inches.
  - 3. Mortar Joints: Concave.
- D. Brick Units:
  - 1. Bond: Running.
  - 2. Coursing: Three units and three mortar joints to equal 8 inches.
  - 3. Mortar Joints: Concave.

### **3.04 PLACING AND BONDING**

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Fill un-grouted cells in exterior walls with vermiculite fill material, as directed.

### **3.05 REINFORCEMENT AND ANCHORAGE**

- A. Reinforcement Bars: Secure at locations indicated and to avoid displacement during grouting. Minimum spacing between bars or to masonry surfaces shall be one bar diameter.
  - 1. Comply with AWS D1.4 for welded splices.

- B. Joint Reinforcement: Install horizontal joint reinforcement 16 inches on center.
  - 1. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
  - 2. Place continuous joint reinforcement in first and second joint below top of walls.
  - 3. Lap joint reinforcement ends minimum 8 inches.
- C. Strap Anchors: Reinforce joint corners and intersections with strap anchors 16 inches on center.
- D. Reinforced Brick Masonry: Maintain grout spaces indicated, free of mortar and not less than 6 inches greater than the sum of bar diameters in the grouted space. Provide temporary dams or barriers to control flow of grout at ends of wall sections; remove dams when grout has hardened sufficiently.
- E. Reinforced Hollow Unit Masonry: Keep vertical cores to be grouted clear of mortar, including bed area of first course.
  - 1. Bond Beams: At bond beams or other locations for horizontally reinforced masonry, provide special masonry units or saw to accommodate reinforcement.

### **3.06 MASONRY FLASHINGS**

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
  - 1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
  - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
  - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend metal flashings through exterior face of masonry and turn down to form drip.
- C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

### **3.07 GROUTING**

- A. Use either high-lift or low-lift grouting techniques, at Contractor 's option, subject to other limitations of contract documents.
- B. Low-Lift Grouting:
  - 1. Limit height of pours to 12 inches.
  - 2. Limit height of masonry to 16 inches above each pour.
  - 3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
  - 4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
- C. High-Lift Grouting:
  - 1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.

2. Clean out masonry cells and other cavities to be grouted by high pressure water spray or compressed air. Remove debris, allow to dry, and inspect before sealing cleanout openings.
3. Brick: Limit pours to maximum 12 feet in height and 25 feet horizontally.
4. Hollow Masonry: Limit lifts to maximum 4 feet and pours to maximum height of 24 feet.
5. Place grout for spanning elements in single, continuous pour.

### **3.08 CONTROL AND EXPANSION JOINTS**

- A. Do not continue horizontal joint reinforcement through control and expansion joints.
- B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
- C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- D. Size control joint in accordance with Section 07900 for sealant performance.
- E. Form expansion joint as detailed.

### **3.09 BUILT-IN WORK**

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
  1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

### **3.10 TOLERANCES**

- A. Maximum Variation from Alignment of Columns: 1/4 inch.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

### **3.11 CUTTING AND FITTING**

- A. Cut and fit for pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

### **3.12 PARGING**

- A. Dampen masonry walls prior to parging.
- B. Scarify each parging coat to ensure full bond to subsequent coat.
- C. Parge masonry walls in two uniform coats of mortar to a total thickness of 3/4 inch.
- D. Steel trowel surface smooth and flat with a maximum surface variation of 1/8 inch per foot.
- E. Strike top edge of parging at 45 degrees.

### **3.13 FIELD QUALITY CONTROL**

- A. An independent testing agency will perform field quality control tests, as specified in Section 01400.
- B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C 140.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM C 780, testing with same frequency as masonry samples.
- D. Test and evaluate grout in accordance with ASTM C 1019 procedures.
  - 1. Test with same frequency as specified for masonry units.
- E. Prism Tests: Test masonry and mortar panels in accordance with ASTM C 1072, E 447, and E 518 provisions; perform tests and evaluate results as specified in individual masonry sections.

### **3.14 CLEANING**

- A. Remove excess mortar and mortar smears as work progresses.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.
- E. Clean glazed surfaces as recommended by the manufacturer.

### **3.15 PROTECTION OF FINISHED WORK**

- A. Without damaging completed work, provide protective boards at exposed external corners which are subject to damage by construction activities.

**END OF SECTION**