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Oakhurst Dairy – New Milk Cooler**SECTION 04810 - UNIT MASONRY ASSEMBLIES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes unit masonry assemblies consisting of the following:
1. Concrete Masonry Units
  2. Glazed Concrete Masonry Units.
  3. Clay Masonry Units Face Brick.
  4. Mortar and grout.
  5. Reinforcing steel.
  6. Masonry joint reinforcement.
  7. Ties and anchors.
  8. Embedded flashing.
  9. Miscellaneous masonry accessories.
  10. Cavity-wall insulation.
- B. Related Sections include the following:
1. Division 7 Section "Bituminous Dampproofing" for dampproofing applied to cavity face of backup wythes of cavity walls.
  2. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
  3. Division 10 Section "Louvers and Vents" for wall vents.
- C. Products furnished, but not installed, under this Section include the following:
1. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."
- D. Products installed, but not furnished, under this Section include the following:
1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
  2. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."

**1.3 DEFINITIONS**

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

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- A. Provide unit masonry that develops the following net-area compressive strengths (f'm) at 28 days. 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 ACI 530.1/ASCE 6/TMS 602.

**1.5 SUBMITTALS**

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Shop Drawings: Show fabrication and installation details for the following:
1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
  2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection: For the following:
1. Unit masonry Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
  2. Colored mortar Samples showing the full range of colors available.
- D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Engineer and approved in writing.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- F. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
1. Each type of masonry unit required.
    - a) Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
    - b) Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
  2. Mortar complying with property requirements of ASTM C 270 BIA M1.
  3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.
- G. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Each type of masonry unit required.

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- a) Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
- b) Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
4. Each material and grade indicated for reinforcing bars.
5. Each type and size of joint reinforcement.
6. Each type and size of anchor, tie, and metal accessory.
- H. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

**1.6 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- E. Sample Panels: Before installing unit masonry, build sample panels, using materials indicated for the completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build sample panels for each type of exposed unit masonry assembly in sizes approximately 48 inches long by 48 inches high by full thickness.
  1. Locate panels in the locations indicated or, if not indicated, as directed by Owner.
  2. Clean exposed faces of panels with masonry cleaner indicated.
  3. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
  4. Protect approved sample panels from the elements with weather-resistant membrane.
  5. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

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6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Engineer in writing.
  - a) Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by Engineer in writing.
7. Demolish and remove sample panels when directed.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
  1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

**1.8 PROJECT CONDITIONS**

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.

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3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

**PART 2 - PRODUCTS****2.1 CONCRETE MASONRY UNITS**

- A. General: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
  2. Provide bullnose units for outside corners in interior walls, unless otherwise indicated.
  3. Provide square-edged units for outside corners in exterior masonry.
  4. Add "Dry-Blok" or approved equal of equal admixture to all exposed exterior masonry units.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi, minimum.
  2. Weight Classification: Standard Masonry Units.
  3. Provide Type II, nonmoisture-controlled units.
  4. Size (Width): Manufactured to the following dimensions:
    - a) 4 inches nominal; 3-5/8 inches actual.
    - b) 6 inches nominal; 5-5/8 inches actual.
    - c) 8 inches nominal; 7-5/8 inches actual.
    - d) 10 inches nominal; 9-5/8 inches actual.
    - e) 12 inches nominal; 11-5/8 inches actual.
- C. Glazed Masonry Units: ASTM C 90 Type 1.
1. Unit Compressive Strength: Provide units with minimum average compressive strength of 1900 psi.

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2. Weight Classification: Lightweight.
3. Surface: Glazed surface shall have a smooth satin-gloss finish, external heat-polymerized cast-on facing conforming to ASTM C 744 and all applicable federal specifications.
4. Water-Repellent: All units shall contain W.R. Grace “Dry-Block”, or approved equal, an integral water repellent CMU admixture at the time of manufacture.
5. Size: Manufactured to the following actual dimensions.
  - a) 7-3/4 inches high by 11-3/4 inches wide by 15-3/4 inches long.
  - b) 7-3/4 inches high by 7-3/4 inches wide by 15-3/4 inches long.
6. Color: As selected by owner from manufacturer’s standard colors unless otherwise indicated.
7. Products: Subjected to compliance with requirements, provide one of the following:
  - a) Trenwyth/Astra-Glaze-SW+, One Connelly Road, PO Box 438, Emigsville, PA 17318.
  - b) Clayton Block Co., Inc., 515 Route 528, Lakewood, NJ 08701.

**2.2 CLAY MASONRY UNITS**

- A. Face Brick: ASTM C 216, Grade MW or SW, Type FBS, and as follows:
  1. Unless otherwise noted use this brick. (Brick to match existing).
  2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.
  3. Initial Rate of Absorption: Less than 20 g/30 sq. in. per minute when tested per ASTM C 67.
  4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated “not effloresced.”
  5. Surface Coloring: (Match existing) Brick with surface coloring other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet.
  6. Size: Manufactured to the following actual dimensions:
    - a) Modular: 3-1/2 to 3-5/8 inches wide by 2-1/4 inches high by 7-1/2 to 7-5/8 inches long.
    - b) Closure Modular: 3-1/2 to 3-5/8 inches wide by 3-1/2 to 3-5/8 inches high by 7-1/2 to 7-5/8 inches long.
  7. Application: Use where brick is exposed, unless otherwise indicated.
  8. Where shown to “match existing,” provide face brick matching color range, texture, and size of existing adjacent brickwork.
  9. Products: Subject to compliance with requirements, provide one of the following:
    - a) Glen-Gery Brick Corporation, 1166 Spring Street, PO Box 7001, Wyomissing, PA 19610-6001.
    - b) The Belden Brick Company, 700 West Tuscarawas, Canton, OH 44702.
    - c) Acme Brick Company, PO Box 425, Fort Worth, TX 76101-0425.

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**Oakhurst Dairy – New Milk Cooler****2.3 MASONRY LINTELS**

- A. Masonry Lintels: Built-in place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in place lintels until cured.

**2.4 MORTAR AND GROUT MATERIALS**

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- D. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- E. Aggregate for Grout: ASTM C 404.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.
- H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
- I. Water: Potable.
- J. Products: Subject to compliance with requirements, provide one of the following:
1. Mortar Cement:
    - a) Magnolia Superbond Mortar Cement; Blue Circle Cement.
    - b) Lafarge Mortar Cement; Lafarge Corporation.
  2. Cold-Weather Admixture:
    - a) Accelguard 80; Euclid Chemical Co.
    - b) Morseled; W. R. Grace & Co., Construction Products Division.
    - c) Trimix-NCA; Sonneborn, Div. of ChemRex, Inc.
  3. Water-Repellent Admixture (to all exposed exterior mortar mix):
    - a) Mortar Tite; Addiment Inc.
    - b) Dry-Block Mortar Admixture; W. R. Grace & Co., Construction Products Division.
    - c) Rheopel; Master Builders.
- K. Epoxy Pointing Mortar: ASTM C 395; epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units) in color as per owner.

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- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60.

**2.6 MASONRY JOINT REINFORCEMENT**

- A. General: ASTM A 951 and as follows:
1. Hot-dip galvanized, carbon-steel wire for exterior walls.
  2. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.
  3. Wire Size for Cross Rods: W2.8 or 0.188-inch diameter.
  4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.
- B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.
- C. For multiwythe masonry, provide types as follows:
1. Ladder type with perpendicular cross rods spaced not more than 16 inches o.c. and 1 side rod for each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod for each wythe of masonry 4 inches or less in width.
  2. Tab type with single pair of side rods spaced for embedment within each face shell of backup wythe and rectangular box-type cross ties spaced not more than 16 inches o.c. Size ties to extend at least halfway through outer wythe but with at least 5/8-inch cover on outside face.
  3. Adjustable (2-piece) type with single pair of side rods and cross ties spaced not more than 16 inches o.c. and with separate adjustable veneer ties engaging the cross ties. Cross ties are either U-shaped with eyes or rectangular. Space side rods for embedment within each face shell of backup wythe and size adjustable ties to extend at least halfway through outer wythe but with at least 5/8-inch cover on outside face.
    - a) Use where indicated and where horizontal joints of facing wythe do not align with those of backup wythe.
    - b) Use where facing wythe is of different material than backup wythe.

**2.7 TIES AND ANCHORS, GENERAL**

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

**2.8 BENT WIRE TIES**

- A. General: Rectangular units with closed ends and not less than 4 inches wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.

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1. Where coursing between wythes does not align, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.
  2. Where wythes are of different materials, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.
- B. Wire: Fabricate from 3/16-inch-diameter, hot-dip galvanized steel wire. Mill galvanized wire ties may be used in interior walls where humidity does not exceed 75 percent.

**2.9 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME**

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

**2.10 ANCHORS FOR CONNECTING TO CONCRETE**

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

**2.11 MISCELLANEOUS ANCHORS**

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.
- B. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
1. Headed bolts.
  2. Nonheaded bolts, bent in manner indicated.
- C. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
1. Type: Expansion anchors.
  2. Type: Undercut anchors.
  3. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
  4. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
  5. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

**2.12 EMBEDDED FLASHING MATERIALS**

- A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:

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1. Copper: 10-oz./sq. ft. weight or 0.0135 inch thick for fully concealed flashing; 16-oz./sq. ft. weight or 0.0216 inch thick elsewhere.
  2. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above and with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
  3. Fabricate metal expansion-joint strips from sheet metal indicated above, formed to shape indicated.
  4. Fabricate metal drip edges from sheet metal indicated above. Extend at least 3 inches into wall and 1/2 inch out from wall, with a hemmed outer edge bent down 30 degrees.
  5. Fabricate metal flashing terminations from sheet metal indicated above. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and then down into joint 3/8 inch to form a stop for retaining sealant backer rod.
- B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use **[one of]** the following, unless otherwise indicated:
1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of 7-oz./sq. ft. sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
  2. Asphalt-Coated Copper Flashing: Manufacturer's standard product consisting of 7-oz./sq. ft. sheet copper coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
    - a) Provide flashing as a complete system with preformed corners, end dams, other special shapes, and seaming materials; all produced by flashing sheet manufacturer.
  3. EPDM Flashing: Manufacturer's standard flashing product formed from a terpolymer of ethylene-propylene diene, complying with ASTM D 4637, 0.040 inch (1.0 mm) thick.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
- E. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- F. Products: Subject to compliance with requirements, provide one of the following:
1. Copper-Laminated Flashing:
    - a) Copper Fabric Flashing; Advanced Building Products, Inc.
    - b) Copper Fabric; AFCO Products, Inc.
    - c) H & B C-Fab Flashing; Hohmann & Barnard, Inc.
    - d) Type FCC-Fabric Covered Copper; Phoenix Building Products.
    - e) Copper Fabric Flashing; Polytite Manufacturing Corp.
    - f) Copper Fabric Flashing; Sandell Manufacturing Co., Inc.

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- g) York Copper Fabric Flashing; York Manufacturing, Inc.
- 2. Asphalt-Coated Copper Flashing:
  - a) Cop-R-Cote; Advanced Building Products, Inc.
  - b) Cop-A-Cote; AFCO Products, Inc.
  - c) H & B C-Coat Flashing; Hohmann & Barnard, Inc.
  - d) Type ACC-Asphalt Bituminous Coated; Phoenix Building Products.
  - e) Coated Copper Flashing; Polytime Manufacturing Corp.
  - f) Coated Copper Flashing; Sandell Manufacturing Co., Inc.
  - g) Copperseal; York Manufacturing, Inc.
- 3. EPDM Flashing:
  - a) FlashGuard; Firestone Building Products.

**2.13 MISCELLANEOUS MASONRY ACCESSORIES**

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from urethane.
- B. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long.
- C. Cavity Drainage Material: 2-inch-thick, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.
  - 1. Provide units with either two loops or four loops as needed for number of bars indicated.
- E. Available Products: Subject to compliance with requirements, cavity drainage materials that may be incorporated into the Work include, but are not limited to, the following:
- F. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Plastic Weep Hole/Vent:
    - a) Cell Vent; Dur-O-Wal, Inc.
  - 2. Cavity Drainage Material:
    - a) Mortar Break; Advanced Building Products, Inc.
    - b) CavClear Masonry Mat; CavClear.
    - c) Mortar Net; Mortar Net USA, Ltd.
    - d) Mortar Stop; Polytime Manufacturing Corp.
  - 3. Reinforcing Bar Positioners:
    - a) D/A 811; Dur-O-Wal, Inc.
    - b) D/A 816; Dur-O-Wal, Inc.
    - c) No. 376 Rebar Positioner; Heckman Building Products, Inc.
    - d) #RB Rebar Positioner; Hohmann & Barnard, Inc.
    - e) #RB-Twin Rebar Positioner; Hohmann & Barnard, Inc.

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- f) Double O-Ring Rebar Positioner; Masonry Reinforcing Corporation of America.
- g) O-Ring Rebar Positioner; Masonry Reinforcing Corporation of America.

**2.14 CAVITY-WALL INSULATION**

- A. Polyisocyanurate Board Insulation: Aluminum-foil-faced, glass-fiber-reinforced, rigid, cellular, polyisocyanurate thermal insulation complying with ASTM C 1289, Type I, Class 2.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

**2.15 MASONRY CLEANERS**

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  - 1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
  - 2. Products: Subject to compliance with requirements, provide one of the following:
    - a) Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:
      - 1) 202 New Masonry Detergent; Diedrich Technologies, Inc.
      - 2) Sure Klean No. 600 Detergent; ProSoCo, Inc.
    - b) Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining:
      - 1) 200 Lime Solv; Diedrich Technologies, Inc.
      - 2) Sure Klean No. 101 Lime Solvent; ProSoCo., Inc
    - c) Cleaners for Brick Subject to Metallic Staining:
      - 1) 202V Vana-Stop; Diedrich Technologies, Inc.
      - 2) Sure Klean Vana Trol; ProSoCo, Inc.

**2.16 MORTAR AND GROUT MIXES**

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270.
  - 1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
  - 2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement, mortar cement, and lime.
  - 3. For masonry below grade, in contact with earth, and where indicated, use Type M.

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4. For reinforced masonry and where indicated, use Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
  2. Verify that foundations are within tolerances specified.
  3. Verify that reinforcing dowels are properly placed.
  4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

**3.2 INSTALLATION, GENERAL**

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
1. Mix units from several pallets or cubes as they are placed.

**3.3 CONSTRUCTION TOLERANCES**

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

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- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

**3.4 LAYING MASONRY WALLS**

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
  - 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

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1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

**3.5 MORTAR BEDDING AND JOINTING**

- A. Lay hollow masonry units as follows:
  1. With full mortar coverage on horizontal and vertical face shells.
  2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
  3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Lay solid brick-size 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.
  1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.
  2. Lay horizontal-cell units with full bed joints, unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
  3. Maintain joint thicknesses indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4-to 3/8-inch- (6- to 10-mm-) thick joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
  1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

**3.6 BONDING OF MULTI-WYTHE MASONRY**

- A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties as shown, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
- B. Use masonry joint reinforcement installed in horizontal mortar joints to bond wythes together.
- C. Use either bonding system specified above.
- D. Use bonding system indicated on Drawings.

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- E. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.
  - 1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.
- F. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
  - 1. Provide individual metal ties not more than 16 inches o.c.
  - 2. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.
  - 3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

**3.7 CAVITIES**

- A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
  - 1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.
  - 2. Provide temporary opening by omitting 1 brick every 48 inches at bottom of cavity and in first course above flashing. After wall has been built to top of cavity and mortar has set, clean out cavity and then close temporary opening.
- B. Parge cavity face of backup wythe using Type S or Type N mortar applied in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.
- C. Coat cavity face of backup wythe to comply with Division 7 Section "Bituminous Dampproofing."
- D. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
  - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

**3.8 MASONRY JOINT REINFORCEMENT**

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches o.c.
  - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
    - a) Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

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

**3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS**

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

**3.10 ANCHORING MASONRY VENEERS**

- A. Anchor masonry veneers to wall framing concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
  - 1. Fasten each anchor section to concrete and masonry backup with two metal fasteners of type indicated.
  - 2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
  - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  - 4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around the perimeter.

**3.11 CONTROL AND EXPANSION JOINTS**

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
  - 1. Install preformed control-joint gaskets designed to fit standard sash block.
- C. Form expansion joints in brick made from clay or shale as follows:
  - 1. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.
- D. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."

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- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
  - 1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
  - 2. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
  - 3. Provide either of above at Contractor's option or provide precast or formed-in-place concrete lintels complying with requirements in Division 3 Section "Cast-in-Place Concrete."
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

**3.13 FLASHING, WEEP HOLES, AND VENTS**

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
  - 1. At multiwythe masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of 8 inches (200 mm), and through inner wythe to within 1/2 inch of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through inner wythe and turn flashing up approximately 2 inches, unless otherwise indicated.
  - 2. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches, and behind air-infiltration barrier or building paper.
  - 3. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.
  - 4. Install metal drip edges beneath flashing at exterior face of wall. Stop flashing 1/2 inch back from outside face of wall and adhere flashing to top of metal drip edge.
  - 5. Install metal flashing termination beneath flashing at exterior face of wall. Stop flashing 1/2 inch back from outside face of wall and adhere flashing to top of metal flashing termination.
  - 6. Cut flashing off flush with face of wall after masonry wall construction is completed.

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- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
  - 1. Absorbent rope made from cotton fiber.
  - 2. Space weep holes 24 inches o.c.

**3.14 REINFORCED UNIT MASONRY INSTALLATION**

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
  - 1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
  - 1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

**3.15 FIELD QUALITY CONTROL**

- A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.
  - 1. Payment for these services will be made by Owner.
  - 2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Mortar properties will be tested per ASTM C 780.
- C. Grout will be sampled and tested for compressive strength per ASTM C 1019.
- D. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.
- E. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.
  - 1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

**3.16 REPAIRING, POINTING, AND CLEANING**

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

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- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
  - 5. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.
  - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

**3.17 MASONRY WASTE DISPOSAL**

- A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 04810