

SECTION 04 81 00 - 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. Decorative concrete masonry units..
 - 3. Mortar and grout.
 - 4. Reinforcing steel.
 - 5. Masonry joint reinforcement.
 - 6. Ties and anchors.
 - 7. Embedded flashing.
 - 8. Miscellaneous masonry accessories.
- B. 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. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
 - 3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."
 - 4. Steel Stud Assemblies, furnished under Division 5 Section "Cold Formed Metal Framing."

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

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

1.5 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified, to comply with requirements in Division 1 Section "Product Data."
- 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."
 2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection of 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. 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 and gross-area compressive strength of clay bricks.
 2. Mortar complying with property requirements of ASTM C 270.
 3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.
 4. Submit concrete mix design for filling masonry cells and bond beams. Use concrete mix having a 28-day compressive strength of 3000 psi.
- E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
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 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.
- F. Hot and Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with hot and 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, 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. Mockup Panels: Before installing unit masonry, build mockup panels, using materials and products indicated for the completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build mockup panels for each type of unit masonry assembly in sizes approximately 48 inches long by 48 inches high by full assembly thickness.
- E.
 - 1. Approval of mockup 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; incorporation of specified and detailed products and accessories and other material and construction qualities specifically approved by Architect in writing.
 - 2. Demolish and remove mockups when directed by Architect.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 - 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.
 - 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 50 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning. Follow manufacturer's recommendations for minimum temperature.
- 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 ALL outside corners and window stools/sills, unless otherwise indicated.

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 for $f'_m=1500$ psi..
2. Weight Classification: Normal weight.
3. Size (Width): Manufactured to the following dimensions:
 - a. 6 inches nominal; 5-5/8 inches actual.
 - b. 8 inches nominal; 7-5/8 inches actual.
 - c. 12 inches nominal; 11-5/8 inches actual.
4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

C. Decorative 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 for $f'_m=1500$ psi.
2. Weight Classification: Normal weight.
3. Size: Manufactured to dimensions indicated.
4. Finish: Exposed faces matching color, pattern, and texture of Architect's samples.
 - a. Normal-weight aggregate, ground finish.
 - b. Normal-weight aggregate, textured finish.
5. Integral Water Repellent: Provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of the test specimen. Provide test results to Architect.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Block Plus W-10; Addiment Inc.
 - 2) Dry-Block; W. R. Grace & Co., Construction Products Division.
 - 3) Rheopel; Master Builders.
6. Field Applied Water Repellent: Where required by Decorative Concrete Masonry Unit manufacturer, provide field applied water repellent, subject to compliance with requirements of masonry manufacturer.
7. Color and Texture: As a minimum standard of quality, this specification is based on the products indicated below:
 - a. CMU #1:
Type: CBIS Kor-Fil
Finish: Ground-Face
Color: Architect to select from standard colors

Mortar: Architect to select from standard colors

8. Manufacturers:

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1) Beavertown Block Co., Inc. (basis of design)
- 2) New Holland Concrete
- 3) Trenwyth Industries, Inc.
- 5) York Building Products, Inc.

2.2 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I 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.
1. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- 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. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
- H. Water: Potable.
- I. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Colored Portland Cement-Lime Mix:
 - a. Eaglebond; Blue Circle Cement.
 - b. Color Mortar Blend; Glen-Gery Corporation.
 - c. Rainbow Mortamix Custom Color Cement/Lime; Holnam, Inc.
 - d. Centurion Colorbond PL; Lafarge Corporation.
 - e. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.

- f. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).
2. Mortar Pigments:
- a. True Tone Mortar Colors; Davis Colors.
 - b. Centurion Pigments; Lafarge Corporation.
 - c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.
3. Water-Repellent Admixture:
- a. Dry-Block Mortar Admixture; W. R. Grace & Co., Construction Products Division.
 - b. Mortar Tite; Addiment Inc.
 - c. Rheopel; Master Builders.

2.3 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615; Grade 60.

2.4 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:

- 1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
 - 2. Wire Size for Side Rods: W1.7 or 0.148-inch diameter unless otherwise noted.
 - 3. Wire Size for Cross Rods: W1.7 or 0.148 diameter unless otherwise noted.
 - 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. Truss type shall not be used in vertically reinforced unit masonry walls.
- C. For multiwythe masonry, provide types as follows:
 - 1. 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. Crossties 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. Unless otherwise indicated, install in first and second courses above finished floor and in alternating back-up masonry courses thereafter.
 - a. Use where indicated and where horizontal joints of facing wythe do not align (2" or less) with those of backup wythe.
 - b. Use where facing wythe is of different material than backup wythe.
 - c. Provide "#270 Ladder Eye-Wire anchor system by Hohmann & Barnard, Inc., or equal product.

2.5 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, and as required by Building Code Requirements for Masonry Structures; use of hot-dipped galvanized ties and anchors in exterior wall construction .
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Galvanized Steel Sheet: ASTM A 653, G60, commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.
- D. Steel Sheet, Galvanized after Fabrication: ASTM A 366 cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
- E. Steel Plates, Shapes, and Bars: ASTM A 36. Plates, shapes, and bars exposed to weather shall be hot-dipped galvanized after fabrication.

2.6 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire anchor section for welding to steel.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.
- B. Channel Slot Anchor: Provide corrugated, 1 ¼-inch wide, 5 ½-inch long, 16 gage, mill galvanized channel slot anchors to engage slot of channel slot anchorages on steel framing beams and column members.

2.7 ANCHORS FOR CONNECTING TO CONCRETE

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section: Dovetail anchor section formed from 0.0966-inch- thick, steel sheet, galvanized after fabrication.

2.8 JOINT STABILIZATION ANCHORS

- A. General: Provide stabilization anchors in horizontal joints of masonry units across the joint between walls at T-shape wall intersections as follows:
 - 1. Use either a manufactured steel unit consisting of two steel rods, minimum 3/16-inch diameter, connected together on each side of masonry joint by sliding plate assemblies that enclose ends of the rods and allow for plate assembly adjustment along the length of the rods; or two (22) corrugated metal wall ties 7/8-inch wide, 7 inches long, 16 gage per joint.
 - 2. As indicated vertical spacing on drawings.

3. Finish: Mill galvanized or hot-dip galvanized to comply with ASTM A 153.

2.9 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.
- B. Dovetail Slots: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.0336-inch 22 gage (0.85-mm), galvanized steel sheet.
- C. 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.
- D. 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: Chemical anchors.
 2. Type: Expansion anchors.
 3. Type: Undercut anchors.
 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.

2.10 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:
 1. Stainless Steel: 26 gage (.018 inches thick).
 2. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above.
 3. Fabricate metal expansion-joint strips from sheet metal indicated above, formed to shape indicated.
- B. Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use the following, unless otherwise indicated:
 1. EPDM: Ethylene Propylene Diene Terpolymer synthetic rubber. Flexible 40 mil elastomeric rubber membrane.
- 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 the following:
 - 1. Pre-fabricated Metal Flashing:
 - a. Cheney Flashing; Cheney Flashing Company, Inc.
 - b. Keystone 3-Way Interlocking Thruwall Flashing; Keystone Flashing Co.
 - c. Sandell
 - 2. EPDM Flashing, flexible membrane:
 - a. Carlisle Pre-Kleened EPDM; Carlisle Coatings & Waterproofing, Incorporated.
 - b. Firestone Flashgard Thru-Wall Flashing; Firestone Building Products Co.

2.11 MISCELLANEOUS MASONRY ACCESSORIES/MATERIALS

- A. Available Products: Subject to compliance with requirements, materials that may be incorporated into the Work include the following:
- B. Compressible Expansion Material: Closed cell neoprene sponge with sensitive adhesive on one side ASTM D-1056 Grade 2A1.

Products: Provide the following:

- 1. Hohmann and Barnard, #NS
- 2. Dur-O-Wal, D/A 2015
- 3. Sandell Mfg. Co., Inc.

- C. Compressible Exterior Expansion Joint Filler: Silicone faced acrylic-impregnated expanding foam sealant and closed-cell foam sealant system. ASTM 1105, compressible up to 50 percent; of width and thickness indicated. Color as selected by Architect, from full range of standard and special colors.

Products: Provide the following:

- 1. Colorseal, Emseal Joint Systems, Ltd.

- D. Preformed Control-Joint Gaskets: Styrene-Butadiene-Rubber Compound designed to fit standard sash block and to maintain lateral stability in masonry wall. ASTM D 2000, Designation M2AA-805.

Products: Provide the following:

- 1. Hohmann and Barnard
- 2. Dur-O-Wal
- 3. Sandell Mfg. Co., Inc.

- E. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- F. Weep Tubes: 3/8" O.D. polyethylene by 4-inch long. Provide with integral cotton wick attached and stainless steel screen insert. Weep tubes to be installed at masonry opening

G. Products: Provide the following:

- 1. Hohmann and Barnard, #341 W/S.

- H. Cavity Drainage Material: free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings, thickness to match cavity air space.

Products: Provide the following:

- 1. Mortar Net ; Mortar Net USA, Ltd.

- I. Cavity Weep: free-draining mesh; made from polyester mesh. Color as selected by Architect, from full range of standard and special colors.

Products: Provide the following:

- 1. Mortar Net Weep Vents, Mortar Net USA, Ltd.
 - a. Height of weep shall match the height of the specified masonry veneer (up to 4" nominal) as indicated in Products. Use the 4" nominal height weep at 8" or higher masonry veneer units.

- J. Cavity Vent: free-draining mesh; made from polyester mesh. Color as selected by Architect, from full range of standard and special colors.

Products: Provide the following:

- 1. Mortar Net Weep Vents, Mortar Net USA, Ltd.
 - a. Height of weep shall match the height of the specified masonry veneer (up to 4" nominal) as indicated in Products. Use the 4" nominal height weep at 8" or higher masonry veneer units.

- K. Cavity Vapor Retarder (Installed over C.M.U.): asphalt based non-fibered emulsion-type which permits moisture vapor to escape through the film while remaining resistant to water penetration ASTM D-1187, ASTM D-1227.

Products: Provide the following:

- 1. Air-Shield, LM, W.R.Meadows
- 2. Perm-A-Barrier VP, W.R. Grace

3. Air Block 07, Henry Co.

L. Cavity Insulation (Installed over C.M.U.): 16"x96" square-edged extruded-polystyrene board. ASTM C578, Type IV, compressive strength 25 p.s.i

Products: Provide the following:

1. Foamular 250, Owens-Corning Co.
2. Cavitymate, Dow Chemical Co.

M. 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.

2.12 MASONRY CLEANERS

A. 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. Follow brick manufacturer's recommendations for cleaning solution for each brick type.

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:
 - 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.

2.13 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Limit cementitious materials in mortar to portland cement and hydrated lime.
 - 2. For masonry below grade, in contact with earth, and where indicated, use Type M, with minimum 28-day compressive strength of 2500 psi.
 - 3. For above grade walls use Type N mortar (1) part portland cement, (1) part hydrated lime Type S and (6) parts sand.
- D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:
 - 1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
 - 2. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.
 - 3. For mineral-oxide pigments and mortar cement mortar, not more than 5 percent.
 - 4. For carbon-black pigment and mortar cement mortar, not more than 1 percent.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.
 - 1. Mix to match Architect's sample.
- F. Grout for Unit Masonry:
 - 1. Use either pea gravel cement concrete or grout confirming to ASTM C476 with a minimum 28-day compressive strength of 3000 psi.
 - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

2.14 SOURCE QUALITY CONTROL

- A. Brick Tests: For each type and grade of brick indicated, meet the requirements of Paragraph 2.2.C of this Section. units will be tested according to ASTM C 67.
- B. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, meet the requirements of Paragraph 2.1.B and 2.1.C of this Section. units will be tested according to ASTM C 140.

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. All elements of Unit Masonry Assemblies shall be installed in accordance with the manufacturer's printed recommendations.
- B. 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.
- C. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- D. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- E. 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.
- F. 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.
- G. Wetting of Brick: Wet brick 3 to 24 hours before laying if the initial rate of absorption exceeds 20 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.
- H. ***No conduit or pipe shall be installed vertically or horizontally in the cavity***, except for items such as wall hydrants, electrical fixtures, etc., for which penetrations shall be horizontal, perpendicular through cavity, located directly at the intended item.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.

- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
- D. For 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. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

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 compress 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.
- C. Set stone trim units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone-joint surface thoroughly before setting; for soiled stone surfaces, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- E. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with grout mortar at [exterior walls, except cavity walls] [, and] solidly with mortar at [interior walls and partitions].

3.6 BONDING OF MULTI-WYTHE MASONRY

- A. Use masonry joint reinforcement installed in horizontal mortar joints to bond wythes together.
- B. 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.
- C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

3.7 CAVITIES

- A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints of back-up wall wythes facing cavities flush.

- B. Installing Cavity-Wall Insulation: Apply rectangular grid adhesive on inside face of insulation boards. 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. Seal or tape all insulation board joints, crack and gaps, piping and conduit penetrations with materials 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.

- a. Reinforcement above is in addition to continuous reinforcement.

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

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

- D. At all flashing locations, reinforcement shall not interrupt the flashing.

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. Anchor masonry to structural members with flexible channel slot anchors embedded in masonry joints and attached to the structure. Provide a 1-inch space in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
 - 2. Space anchors at the location of the slotted channel anchor assembly on the structure member.

3.10 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. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces. Maximum distance between C.M.U. control joints shall not exceed distances as indicated on Structural Drawings.
 2. Install preformed control-joint gaskets designed to fit sash block.
- C. Form building expansion joints in exterior masonry veneer as follows:
1. Form open joint of width indicated; install compressible exterior expansion joint filler as per manufacturers' recommendation. Keep joint free and clear of mortar. Locations as indicated on drawings.
- D. Build in pressure-relieving expansion joints where indicated; construct joints by installing compressible expansion material.

3.11 LINTELS

- A. Install lintels where indicated.
- B. Provide lintels at all masonry wall openings greater than 12" wide. Refer to Structural drawings and Lintel Schedule

3.12 FLASHING, WEEPS, AND VENTS

- A. General: Install continuous embedded flashing and weeps 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. Adhere all flashing to steel angles.
- C. Install flashing as follows:
 - 1a. At thru-wall base flashing conditions and at composite masonry walls, including cavity walls, extend EPDM flashing from a point a minimum of 1 inch beyond the exterior face of the outer wythe of masonry, through the outer wythe, turned up a minimum of 16 inches (behind insulation) and into the inner wythe 1-1/2 inches. Seal laps between lengths of flashing with lap sealant, over lap min. 4". Provide positive drainage to weeps where bottom of flashing turns out to outer wythe. Trim off flashing uniformly 1/4" beyond the face of veneer when joint is fully cured, but not before directed by Architect (creating 1/4" drip edge).
 - 1c. At masonry opening (i.e. window) sill flashing conditions, extend EPDM flashing from a point a minimum of 1 inch beyond the exterior face of the outer wythe of masonry, through the outer wythe, turned up vertically and continuing horizontally

to meet angle flashing stop. Flashing to extend vertically in joint between window frame and vertical leg of angle flashing stop, terminating just below top edge. Flashing to be consealed below joint sealant. Seal laps between lengths of flashing with lap sealant, over lap min. 4". Install weep tubes with integral cotton wick cords laid flat, horizontally along inside face of the outer wythe of masonry Provide positive drainage to weeps where bottom of flashing turns out to outer wythe. Trim off flashing uniformly 1/4" beyond the face of veneer when joint is fully cured, but not before directed by Architect (creating 1/4" drip edge).

2. At lintels and shelf angles, extend EPDM flashing a minimum of 4 inches into masonry at each end. each end dam, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan. Trim off flashing uniformly 1/4" beyond the face of veneer when joint is fully cured, but not before directed by Architect (creating 1/4" drip edge). Seal laps between lengths of flashing with lap sealant, over lap min. 4".

3a. At low roof to high wall conditions, composite masonry walls, including cavity walls, install a (two piece interlocking type) 26 gauge stainless steel sheet flashing through the outer wythe of masonry. Turn up embedded piece a minimum of 2 inches, flush with inner wythe of masonry at cavity to form a pan (Behind insulation). Overlap ends of stainless steel flashing a minimum of 6 inches and seal lap with elastomeric sealant. Extend EPDM flashing from a point 1 inch behind exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 16 inches (behind insulation) and into the inner wythe 1-1/2 inches. Seal lap between stainless steel flashing and EPDM flashing with elastomeric sealant. Install interlocking piece of flashing over roof termination as indicated on drawing.

D. Install cavity weeps, vents, tube and drainage material in the head joints in exterior wythes of masonry as indicated on drawing and as follows:

1. Space cavity weeps at min. 24" o.c., 16" o.c. at 16" long masonry units.
2. Space cavity vents at min. 48" o.c.
3. Space weep tubes at min. 24" o.c.
4. Place continuous cavity drainage material immediately above flashing in cavities.
5. Test weep with water poured into cavity to insure draining water freely comes out of each weep hole.

E. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

F. Apply cavity vapor retarder on the entire exterior face of the inner wythe of masonry of the cavity wall.

G. Install vapor retarder on the entire exterior face of the metal stud wall sheathing.

3.13 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 the formwork 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.

3.14 FIELD QUALITY CONTROL

- A. Contractor shall engage a qualified independent testing agency to perform field quality-control testing indicated below.
- B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 35K bricks or 5700 concrete masonry units Testing requirements for mortar and grout may be deleted if prism testing is retained.
- C. Mortar properties will be tested per ASTM C 780.
- D. Grout will be sampled and tested for compressive strength per ASTM C 1019.
- E. Prism-Test Method: For each type of structural masonry wall construction indicated, masonry prisms will be tested per ASTM C 1314, and as follows:
1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.
- F. Test weeps. Allow masonry 12 hours setting time before test. Test to be done in 10' lengths of cavity.

3.15 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry 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.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.16 MASONRY WASTE DISPOSAL

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

END OF SECTION