

**SECTION 04860 - STONE VENEER 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 stone veneer in the following applications:
  - 1. Anchored to concrete backup.
  - 2. Anchored to cold-formed metal framing and sheathing.
- B. Related Sections include the following:
  - 1. Division 4 Section "Unit Masonry Assemblies" for mortar, horizontal joint reinforcement, and veneer anchors.
  - 2. Division 9 Section "Dimension Stone Tile."
  - 3. Division 9 Section "Interior Stone Facing."
- C. Products installed, but not furnished, in this Section include the following:
  - 1. Steel lintels and shelf angles for stone veneer assemblies specified in Division 5 Section "Metal Fabrications."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Stone Samples for Verification: For each color, grade, finish, and variety of stone required.
- C. Quality Assurance Submittals:
  - 1. Local/regional source certification: Manufacturer or fabricator's certificate indicating location, and distance in miles from the Project Site, of each Product's final assembly, extraction, harvesting, or recovery prior to shipment to the Project Site.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who employs experienced stone masons and stone fitters who are skilled in installing stone veneer assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in-service performance.
- B. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry with resources to provide materials of consistent quality in appearance and physical properties.
- C. Mockups: Build mockups to demonstrate aesthetic effects and qualities of materials and execution.
  - 1. Build mockups for each type of stone veneer assembly in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup.
    - a. Include through-wall flashing installed for a 24-inch length in corner of mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit stone veneer above half of flashing).
  - 2. Protect accepted mockups from the elements with weather-resistant membrane.

3. Approval of mockups is for color, texture, and blending of stone; relationship of mortar and sealant colors to stone colors; tooling of joints; and aesthetic qualities of workmanship.
  - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
  - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo.
  1. 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.
- B. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.6 PROJECT CONDITIONS

- A. Protection of Stone Veneer Assemblies: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.
  1. Cover partially completed stone veneer assemblies when construction is not in progress.
  2. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone veneer assemblies.
  1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the 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 end of each day to prevent rain from splashing mortar and dirt on completed stone veneer assemblies.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost.
  1. Do not build on frozen subgrade or setting beds.
  2. Remove and replace stone veneer assemblies damaged by frost or freezing conditions.
  3. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  4. Cold-weather cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

### PART 2 - PRODUCTS

#### 2.1 STONE

- A. Stone:
  1. Maximum absorption, by weight: 6 percent according to ASTM C 97.
  2. Minimum compressive strength: 4,000 pounds per square inch according to ASTM C 170.
  3. Finish and color: Match Architect's samples.

#### 2.2 MORTAR MATERIALS

- A. Mortar Materials: Comply with Division 4 Section "Unit Masonry Assemblies."

## 2.3 VENEER ANCHORS

- A. Materials:
  - 1. Stainless steel wire: ASTM A 580/A 580M, Type 316.
  - 2. Stainless steel sheet: ASTM A 666, Type 316.
  
- B. Adjustable, Screw-Attached Veneer Anchors at Steel Studs: Units consisting of a wire tie section and a metal anchor section that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:
  - 1. Structural performance characteristics: Capable of withstanding a 100 pound load in both tension and compression without deforming or developing play in excess of 0.05 inch.
  - 2. Anchor section: Sheet metal plate with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
    - a. Plate 1-1/4 inches wide by 6 inches long with strap 5/8 inch wide by 3-5/8 inches long; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than 1/32 inch.
  - 3. Metal sheet: Type 316 stainless steel, 0.1094 inch thick.
  - 4. Wire tie section: Rectangular-shaped, diameter as required to resist specified loads, Type 316 stainless steel, with 2 vertical dowels designed to engage 2 courses of stone veneer.
  - 5. Available products:
    - a. Hohmann & Barnard, Inc.; DW-10HS with #330 tie.
  
- C. Rigid Stone Anchors: Fabricate anchors, including shelf angles, from stainless steel, ASTM A 666, Type 316, temper as required to support loads imposed without exceeding allowable design stresses.
  - 1. Fasteners: Annealed stainless-steel bolts, nuts, and washers; ASTM F 593/F 738M) for bolts and ASTM F 594/F 836M) for nuts, Alloy Group 2/A4.
  
- D. Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10, in length required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion-protective coating:
  - 1. Organic polymer coating with salt-spray resistance to red rust of more than 500 hours per ASTM B 117.
  - 2. Available products:
    - a. Elco Industries, Inc.: Dril-Flex.
    - b. Hilti Corp.: Kwik-Flex.
    - c. Illinois Tool Works, Inc.: TRAXX Screws.
    - d. Rawlplug Co., Inc. (The); Perma-Seal Coated Twin-Fast.
  
- E. Steel Tapping Screws for Concrete Masonry: Self-tapping screws with specially designed threads for tapping and wedging into masonry, with hex washer head and neoprene washer, 3/16-inch diameter by 1-1/2-inch length, and with the following corrosion-protective coating:
  - 1. Organic polymer coating with salt-spray resistance to red rust of more than 500 hours per ASTM B 117.
  - 2. Available products:
    - a. Illinois Tool Works, Inc.: Buildex; Tapcon.
    - b. The Rawlplug Co., Inc.: Tapcon.

## 2.4 EMBEDDED FLASHING MATERIALS

- A. Embedded (Through-Wall) Flashing: 36 mill thick rubberized asphalt laminated to 4 mill thick cross laminated polyethylene film, with pre-formed corners and end dams, and with 0.015 inch thick stainless steel drip edge.
  - 1. Primer: As recommended and supplied by flashing manufacturer.
  - 2. Termination mastic: As recommended and supplied by flashing manufacturer
  - 3. Products: Provide the following:
    - a. Illinois Products Corporation: IPCO Flashing with Type H Stainless Steel Drip Edge.
    - b. Substitutions: Not allowed.
- B. Flashing Termination Bar: ASTM A 167 Type 304 stainless steel, or ASTM A 176 Type 304 stainless steel.
- C. Metal Flashing: Fabricated from the following metal complying with requirements specified under Division 7 Section "Sheet Metal Flashing and Trim" and below:
  - 1. Stainless steel: Type 316, 0.015 inch thick.
  - 2. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cheney Flashing Company: 3-Way Sawtooth Design.
    - b. Keystone Flashing Company: 3-Way Bond.

## 2.5 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 neoprene or urethane.
- B. Asphalt Dampproofing for Concrete Backup: Cut-back asphalt complying with ASTM D 4479, Type I, or asphalt emulsion complying with ASTM D 1227, Type III or IV.
- C. Weep Holes: Medium-density polyethylene, 3/8-inch OD by thickness of stone veneer assembly with cotton or polyester rope, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity behind stone veneer assembly.
- D. Cavity Drainage Material: 2-inch- thick, free-draining mesh made from polyethylene strands and shaped to avoid being clogged by mortar droppings.
  - 1. Available Products:
    - a. Mortar Net USA, Ltd.; Mortar Net.
    - b. Substitutions: Not allowed.

## 2.6 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.

## 2.7 STONE FABRICATION

- A. General: Fabricate stone in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.
- B. Cut and select stone to produce pieces of thickness, size, and shape indicated and to comply with fabrication and construction tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.
  - 1. Clean sawed backs of stone to remove rust stains and iron particles.
- C. Dress joints (bed and vertical) straight and at right angle to face, unless otherwise indicated.
- D. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

1. Finish: Natural cleft.
  - E. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication.
    1. Replace defective units before shipment.
- 2.8 MORTAR MIXES
- A. Mortar Mixes: Comply with Division 4 Section "Unit Masonry Assemblies."

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine surfaces indicated to receive stone veneer assemblies, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
  1. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in unit masonry or concrete and required for or extending into stone veneer assemblies are correctly installed.
  2. Examine wall framing, sheathing, and building paper or building wrap to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.
  3. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Advise installers of other work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone veneer assemblies.
- B. Accurately mark stud centerlines on face of building paper or building wrap before beginning stone installation.
- C. Coat concrete backup with asphalt dampproofing.
- D. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting.
  1. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water.
  2. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

#### 3.3 SETTING OF STONE VENEER, GENERAL

- A. Perform necessary field cutting as stone is set.
  1. Use power saws to cut stone.
  2. Cut lines straight and true, with edges eased slightly to prevent snipping.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange and trim stones for accurate fit in pattern indicated, with uniform joint widths.
- D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance, as accepted by Architect.
- E. Set stone to comply with requirements indicated on Drawings.
  1. Install veneer anchors, supports, fasteners, and other attachments indicated or necessary to secure stone veneer assemblies in place.
  2. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

- F. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment, if any.
  - 1. Lay walls with joints not less than 1/4 inch at narrowest points nor more than 3/8 inch at widest points.
- G. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
  - 1. Keep expansion and pressure-relieving joints free of mortar and other rigid materials.
  - 2. Sealing expansion, control, and pressure-relieving joints is specified in Division 7 Section "Joint Sealants."
- H. Install through-wall flashing at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated as follows:
  - 1. Clean surfaces to receive adhesive side of flashing smooth and free from dust, dirt, oil, foreign matter, and projections which could damage flashing material.
    - a. Allow surfaces to dry.
  - 2. Install stainless steel drip edge using construction adhesive acceptable to flashing manufacturer.
    - a. Extend bent portion of stainless steel drip edge 1/4 inch beyond face of stone.
  - 3. Prime surface to receive flashing using flashing primer at a rate recommended by flashing manufacturer.
  - 4. Where flashing is not continuous, provide flashing manufacturer's pre-formed end dams in height equal to the masonry unit.
  - 5. Provide flashing manufacturer's pre-formed corners at inside and outside corners.
  - 6. Remove release paper and position through-wall flashing against surface.
    - a. Recess flashing 1/2 inch from outside vertical face of stone.
    - b. Fully adhere flashing to substrate with steel hand roller.
    - c. Overlay adjacent pieces 4 inches and adhere with steel hand roller.
    - d. Overlay end dams and corner units 4 inches and adhere with steel hand roller.
    - e. Seal penetrations with flashing manufacturer's recommended mastic.
    - f. Seal edges of overlaps with flashing manufacturer's recommended mastic.
    - g. Seal top edge of through-wall flashing with flashing manufacturer's recommended mastic.
  - 7. Turn flashing up not less than 6 inches above cavity wall netting.
    - a. At sheathing locations, secure and seal flashing to sheathing, air-infiltration barrier, using flashing termination bar and flashing manufacturer's recommended mastic.
      - 1) Anchor flashing termination bar into substrate at 16 inches on center.
  - 8. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end.
    - a. At heads and sills, extend flashing 2 inches onto pre-formed end dams.
  - 9. Cover flashing with bed of mortar before placing stone on flashing
- I. Install metal flashing where indicated as follows:
  - 1. At cold-formed metal-framed walls, extend flashing from exterior face of veneer, through the veneer, up the face of sheathing at least 8 inches, and behind air and vapor barrier.
  - 2. At lintels and shelf angles, extend flashing full length of angles but not less than 4 inches into masonry at each end.
  - 3. At heads and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.
  - 4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
  - 5. Extend sheet metal flashing 1/2 inch beyond face of stone at exterior and turn flashing down to form a drip.
- J. Install one continuous roll of cavity drainage material directly over flashing.
  - 1. Install with dovetail shaped section facing up.
  - 2. Cut cavity drainage material to accommodate wall ties, horizontal wall reinforcement, electrical conduit, and other penetrations.
- K. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and at flashing.
  - 1. Space weep holes 16 inches on center.
  - 2. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
  - 3. Keep weep holes and area above flashing free of mortar droppings.

### 3.4 CONSTRUCTION TOLERANCES

- A. Variation from Plumb:
  - 1. For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more.
  - 2. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.
- D. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.
- E. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

### 3.5 INSTALLATION OF ANCHORED STONE VENEER ASSEMBLIES

- A. Anchor stone veneer to unit masonry with metal veneer anchors as follows:
- B. Anchor stone veneer to unit masonry with adjustable, screw-attached veneer anchors as follows:
  - 1. Fasten each anchor section to unit masonry with two screws.
  - 2. Embed wire tie section in mortar joints to within 1-1/2 inches of face.
- C. Anchor stone veneer to unit masonry with seismic veneer anchors as follows:
  - 1. Fasten each anchor section to unit masonry with two screws.
  - 2. Embed connector section in mortar joints to within 1-1/2 inches of face.
- D. Anchor stone veneer to cold-formed metal framing with adjustable, screw-attached veneer anchors as follows:
  - 1. Fasten each anchor section through sheathing to framing with two screws.
  - 2. Embed wire tie section in mortar joints to within 1-1/2 inches of face.
- E. Anchor stone veneer to cold-formed metal framing with seismic veneer anchors as follows:
  - 1. Fasten each anchor section through sheathing to framing with two screws.
  - 2. Embed connector section in mortar joints to within 1-1/2 inches of face.
- F. Space veneer anchors not more than 16 inches on center vertically and 24 inches on center horizontally.
  - 1. Install additional veneer anchors within 12 inches of openings, sealant joints, and perimeter at intervals not exceeding 12 inches.
- G. Set stone in full bed of mortar with full head joints, unless otherwise indicated.
  - 1. Build veneer anchors into mortar joints as stone is set.
- H. Provide not less than 2-inch air space between stone veneer assemblies and backup construction, unless otherwise indicated.
  - 1. Keep air space free of mortar droppings and debris.
  - 2. Slope beds toward air space to minimize mortar protrusions into air space.
    - a. As work progresses, trowel mortar fins protruding into air space flat against back of veneer.
- I. Rake out joints for pointing with mortar to depth of not less than 3/4 inch before setting mortar has hardened.
  - 1. Rake joints to uniform depths with square bottoms and clean sides.

3.6 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles.
  - 1. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch deep.
  - 1. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
  - 1. Joint profile: Slightly concave.

3.7 ADJUSTING AND CLEANING

- A. Remove and replace stone veneer assemblies of the following description:
  - 1. Broken, chipped, stained, or otherwise damaged stone.
    - a. Stone may be repaired if methods and results are approved by Architect.
  - 2. Defective joints.
  - 3. Stone veneer assemblies not matching approved samples and mockups.
  - 4. Stone veneer assemblies not complying with other requirements indicated.
- B. Replace in a manner that results in stone veneer assemblies' matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stone veneer assemblies as work progresses.
  - 1. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean stone veneer assemblies as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes.
    - a. Obtain Architect's approval of sample cleaning before cleaning stone veneer assemblies.
  - 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. Clean stone veneer assemblies by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.

3.8 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.
- B. Excess Masonry Waste: Comply with Division 1 Section "Construction Waste Management."

END OF SECTION 04860

**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. Face brick.
  - 3. Mortar and grout.
  - 4. Reinforcing steel.
  - 5. Masonry joint reinforcement.
  - 6. Ties and anchors.
  - 7. Embedded flashing.
  - 8. Miscellaneous masonry accessories.
  - 9. Masonry-cell insulation.
  - 10. Cavity-wall insulation.
- B. Related Sections include the following:
  - 1. Division 7 Section "Water Repellents" for water repellents applied to unit masonry assemblies.
  - 2. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
  - 3. Division 7 Section "Fire-Resistive Joint System" for firestopping at tops of masonry walls and at openings in masonry walls.
- 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. 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."

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.
  - 1. Determine compressive strength of masonry from net-area compressive strengths of masonry units and mortar types according to Table 2105.2.2.1.2 of the International Building Code, 2000 Edition.
  - 2. For concrete unit masonry:  $f'_m = 1,500$  pounds per square inch.

1.5 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Recycled content certification: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and post-industrial recycled content by weight for each Product specified under this Section.
- C. Local/regional source certification: Manufacturer or fabricator's certificate indicating location, and distance in miles from the Project Site, of each Product's final assembly, extraction, harvesting, or recovery prior to shipment to the Project Site
- D. Shop Drawings: Show fabrication and installation details for the following:
  - 1. Reinforcing steel: Detail bending and placement of unit masonry reinforcing bars.
    - a. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
- E. Samples for Initial Selection: For the following:
  - 1. Colored mortar Samples showing the full range of colors available.
- F. Samples for Verification: For the following:
  - 1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
  - 2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction.
    - a. Make samples using the same sand and mortar ingredients to be used on Project.
    - b. Label Samples to indicate types and amounts of pigments used.
- G. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- H. 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 test results, measurements, and calculations establishing net-area compressive strength of masonry units.
  - 2. Mortar complying with property requirements of ASTM C 270.
  - 3. Grout mixes complying with compressive strength requirements of ASTM C 476.
    - a. Include description of type and proportions of grout ingredients.
- I. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
  - 1. Each type of masonry unit required.
    - a. 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.
  - 4. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Table 2105.2.2.1.2 of the International Building Code, 2000 Edition.
    - a.
  - 5. Each material and grade indicated for reinforcing bars.
  - 6. Each type and size of joint reinforcement.
  - 7. Each type and size of anchor, tie, and metal accessory.

1.6 Quality Assurance Submittals:

- 1. Documentation for each applicable Product, indicating maximum volatile organic compound (VOC).
- 2. Cold-weather procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.7 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. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the following preconstruction testing:
  - 1. Concrete masonry unit test: For each concrete masonry unit indicated, per ASTM C 140.
  - 2. Grout test: For compressive strength per ASTM C 1019.
- E. 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.
- F. Mockups: Before installing unit masonry, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Locate mockups in the locations indicated or, if not indicated, as directed by Architect.
  - 2. Build mockup of typical exterior wall area as shown on Drawings.
  - 3. Build mockups for the following types of masonry in sizes approximately 4 feet wide by 8 feet high by full thickness, including each type of face and backup wythes, and accessories. Include a sealant-filled joint at least 4 feet long in each mockup.
    - a. Each type of exposed unit masonry construction.
    - b. Each type of exterior wall construction.
    - c. Typical exterior wall with lower corner of window opening.
      - 1) Make opening approximately 12 inches wide by 16 inches high.
    - d. Typical exterior wall with through-wall flashing installed for each type of back-up, with a 24-inch length in corner of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
    - e. Typical exterior masonry-veneer wall complete with metal studs, sheathing, veneer ties, flashing, and weep holes.
    - f. Typical exterior masonry-veneer wall complete with masonry back-up, horizontal reinforcing, veneer ties, flashing, and weep holes.
  - 4. Clean exposed faces of mockups with masonry cleaner as indicated.
  - 5. Notify Owner and Architect seven days in advance of dates and times when mockups will be constructed.
  - 6. Protect accepted mockups from the elements with weather-resistant membrane.
  - 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 8. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
  - 9. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location.
  - 1. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
  - 2. If units become wet, do not install until they are dry.
  - 3. 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. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo.
  - 1. 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.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 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.
  - 1. Cover partially completed masonry when construction is not in progress.
  - 2. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  - 3. 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, soil, and other contaminants from staining the face of masonry to be left exposed or painted.
  - 1. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 2. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
  - 3. Protect sills, ledges, and projections from mortar droppings.
  - 4. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 5. 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:
  - 1. Do not use frozen materials or materials mixed or coated with ice or frost.
  - 2. Do not build on frozen substrates.
  - 3. Remove and replace unit masonry damaged by frost or by freezing conditions.
  - 4. Comply with cold-weather construction requirements contained in Section 2104.3 of the International Building Code.
  - 5. Cold-weather cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements:
  - 1. Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout.
  - 2. Provide artificial shade and wind breaks and use cooled materials as required.
  - 3. When ambient temperature exceeds 100 degrees F, or 90 degrees F with a wind velocity greater than 8 miles per hour, do not spread mortar beds more than 48 inches ahead of masonry.
    - a. 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.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
  - 1. Unit compressive strength: Provide units with minimum average net-area compressive strength of 1,900 pounds per square inch.
  - 2. Weight classification: Lightweight, unless otherwise indicated.
  - 3. Provide Type I, moisture-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.
  - 5. Exposed faces: Manufacturer's standard color and texture, unless otherwise indicated.

### 2.2 BRICK

- A. General: Provide shapes indicated and as follows for each form of brick required:
  - 1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.
- B. Face Brick: 100 percent reclaimed brick, free of mortar, dirt, paint, and other surface defects not acceptable to Architect.
  - 1. Size: Approximately 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
  - 2. Color and texture: Match Architect's samples.

### 2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, hydrated lime complying with ASTM C 207, and mortar pigments.
  - 1. 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.
  - 2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Blue Circle Cement: Eaglebond.
    - b. Glen-Gery Corporation: Color Mortar Blend.
    - c. Holnam, Inc.: Rainbow Mortamix Custom Color Cement/Lime.
    - d. Lafarge Corporation: Centurion Colorbond PL.
    - e. Lehigh Portland Cement Co.: Lehigh Custom Color Portland/Lime.
    - f. The Riverton Corporation: Riverton Portland Cement Lime Custom Color.
- B. 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.
- C. Aggregate for Grout: ASTM C 404.
- D. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. W. R. Grace & Co., Construction Products Division: Dry-Block Mortar Admixture.
    - b. Master Builders: Rheopel.
- E. Water: Potable.

### 2.4 REINFORCING STEEL

- 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, containing not less than 100 percent recycled steel.

## 2.5 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
  - 1. Finish:
    - a. Interior walls: Hot-dip galvanized, carbon-steel wire.
    - b. Exterior walls: Stainless-steel wire.
  - 2. Wire size for side rods: 9 gage diameter.
  - 3. Wire size for cross rods: 9 gage diameter.
  - 4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- B. For single-wythe masonry, provide ladder type with single pair of side rods and cross rods spaced not more than 16 inches on center.
- C. Horizontal Reinforcement For Concrete Block With Brick Veneer, or Brick With Brick Veneer Walls: Adjustable (2-piece) type with single pair of stainless steel side rods, stainless steel cross ties spaced not more than 16 inches on center, and with separate adjustable stainless steel U-shaped veneer ties with eyes, engaging the cross ties. 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.
  - 1. Wire: ASTM A 580/A 580M, Type 316 stainless steel.
    - a. Side wires: 9 gage.
    - b. Cross wires: 9 gage.
    - c. Ties: 3/16 inch.
  - 2. Provide projecting eyes on both sides of ladder at walls with veneer on both sides.
  - 3. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Hohmann and Barnard, Inc. Lox-All Adjustable Eye-Wire Ladder Type #270.

## 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, Type 316 stainless-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, Type 316 stainless-steel wire.

## 2.7 ANCHORS FOR CONNECTING TO CONCRETE

- A. Adjustable, Screw-Attached Veneer Anchors: Units consisting of a wire tie section and a metal anchor section that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, and as follows:
  - 1. Structural performance characteristics: Capable of withstanding a 100 pound load in both tension and compression without deforming or developing play in excess of 0.05 inch.
  - 2. Anchor section: Type 316 stainless steel metal plate with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
    - a. Plate 1-1/4 inches wide by 6 inches long with strap 5/8 inch wide by 3-5/8 inches long; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than 1/32 inch.

3. Metal sheet: Type 316 stainless steel, 0.1094 inch thick.
4. Wire tie section: Triangular or rectangular-shaped, 0.1875-inch- diameter, Type 316 stainless steel wire tie sized to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
5. Available products:
  - a. Hohmann & Barnard, Inc.; DW-10HS.

B. Steel Tapping Screws for Concrete Masonry: Self-tapping screws with specially designed threads for tapping and wedging into masonry, with hex washer head and neoprene washer, 3/16-inch diameter by 1-1/2-inch length, and with the following corrosion-protective coating:

1. Organic polymer coating with salt-spray resistance to red rust of more than 500 hours per ASTM B 117.
2. Available Products:
  - a. Illinois Tool Works, Inc.: Buildex; Tapcon.
  - b. The Rawplug Co., Inc.: Tapcon.

## 2.8 ADJUSTABLE MASONRY-VENEER ANCHORS AT STUD FRAMES WALLS

A. Adjustable, Screw-Attached Veneer Anchors at Steel Studs: Units consisting of a wire tie section and a metal anchor section that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

1. Structural performance characteristics: Capable of withstanding a 100 pound load in both tension and compression without deforming or developing play in excess of 0.05 inch.
2. Anchor section: Type 316 stainless steel plate with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
  - a. Plate 1-1/4 inches wide by 6 inches long with strap 5/8 inch wide by 3-5/8 inches long; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than 1/32 inch.
3. Metal sheet: Type 316 stainless steel, 0.1094 inch thick.
4. Wire tie section: Triangular or rectangular-shaped, 0.1875-inch- diameter, Type 316 stainless steel wire tie sized to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
5. Available products:
  - a. Hohmann & Barnard, Inc.; DW-10HS.

B. Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10, in length required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion-protective coating:

1. Organic polymer coating with salt-spray resistance to red rust of more than 500 hours per ASTM B 117.
2. Available products:
  - a. Elco Industries, Inc.: Dril-Flex.
  - b. Hilti Corp.: Kwik-Flex.
  - c. Illinois Tool Works, Inc.: TRAXX Screws.
  - d. Rawplug Co., Inc. (The); Perma-Seal Coated Twin-Fast.

## 2.9 MISCELLANEOUS ANCHORS

A. 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. Nonheaded bolts, bent in manner indicated.

## 2.10 EMBEDDED FLASHING MATERIALS

- A. Embedded (Through-Wall) Flashing: 36 mill thick rubberized asphalt laminated to 4 mill thick cross laminated polyethylene film, with pre-formed corners and end dams, and with 0.015 inch thick stainless steel drip edge.
  - 1. Primer: As recommended and supplied by flashing manufacturer.
  - 2. Termination mastic: As recommended and supplied by flashing manufacturer.
  - 3. Products: Provide the following:
    - a. Illinois Products Corporation: IPCO Flashing with Type H Stainless Steel Drip Edge.
    - b. Substitutions: Not allowed.
- B. Flashing Termination Bar: ASTM A 167 Type 316 stainless steel, or ASTM A 176 Type 316 stainless steel.
  - 1. Size: 1 inch high by 1/8 inch thick.
  - 2. Hole spacing: 16 inches on center.

## 2.11 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 neoprene or urethane.
- B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
  - 1. Styrene-butadiene-rubber compound: ASTM D 2000, Designation M2AA-805.
- C. Cavity Drainage Material: 2-inch thick, free-draining mesh; made from 100 percent recycled polyethylene strands and shaped to avoid being clogged by mortar droppings].
  - 1. Products: Provide the following:
    - a. Mortar Net USA, Ltd.: Mortar Net.
    - b. Substitutions: Not allowed.
- D. Air and Vapor Barrier: Self-adhering polyethylene faced membrane complying with ASTM D 1970, minimum of 40-mil- thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.
  - 1. Width: 36 inches.
  - 2. Surface conditioner (primer): Water based system.
  - 3. Volatile organic compound (VOC): Not more than 350 grams per liter.
  - 4. Available products:
    - a. W. R. Grace & Co.-Conn.: Perm-A-Barrier Wall Membrane Air and Vapor Barrier.
- E. 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, 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.
  - 2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Dur-O-Wal, Inc.: D/A 811.
    - b. Dur-O-Wal, Inc.: D/A 816.
    - c. Heckman Building Products, Inc.: No. 376 Rebar Positioner.
    - d. Hohmann & Barnard, Inc.: #RB Rebar Positioner.
    - e. Hohmann & Barnard, Inc.: #RB-Twin Rebar Positioner.
    - f. Masonry Reinforcing Corporation of America: Double O-Ring Rebar Positioner.
    - g. Masonry Reinforcing Corporation of America: O-Ring Rebar Positioner;

2.12 MASONRY-CELL INSULATION

- A. Loose-Granular Fill Insulation: Vermiculite complying with ASTM C 516, Type II (surface treated for water repellency and limited moisture absorption), Grade 3 (Fine), complying with 29 CFR 1926 by containing less than 0.10 percent by weight of asbestos and that demonstration shows will not release asbestos fibers in excess of 0.1 fibers per cubic centimeter under reasonably foreseeable Project-site conditions.

2.13 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: HCFC free rigid, cellular, polystyrene thermal insulation with closed cells and integral high-density skin; formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type X.
  - 1. Thickness: 2 inches.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.
  - 1. Volatile organic compound content: Not more than 50 grams per liter.
  - 2. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. 3M Adhesive Division: Fastbond Insulation Adhesive 42-NF Plus NV.

2.14 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 gallon of water.

2.15 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including 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:
  - 1. Furnish dry mortar ingredients in the form of a preblended mix.
  - 2. 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 lime.
  - 2. For masonry below grade, in contact with earth, and where indicated, use Type M.
  - 3. For reinforced masonry and where indicated, use Type S.
  - 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.
  - 1. Limit pigments to the following percentages of cement content by weight:
  - 2. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
- E. Grout for Unit Masonry: Comply with ASTM C 476 with a compressive strength of not less than 2,000 pounds per square inch at 28 days.
  - 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.

2.16 SOURCE QUALITY CONTROL

- A. Owner may engage a qualified independent testing agency to perform source 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. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, 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. 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.
  - 1. 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.
  - 1. Cut units as required to provide a continuous pattern and to fit adjoining construction.
  - 2. Where possible, use full-size units without cutting.
  - 3. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified.
  - 4. 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.
- F. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 grams per 30 square inch per minute when tested per ASTM C 67.
  - 1. Allow units to absorb water so they are damp but not wet at the time of laying.

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.
  - 1. 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.
  - 1. 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.
  - 1. 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, unless otherwise indicated on Drawings.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches.
  - 1. Bond and interlock each course of each wythe at corners.
  - 2. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work:
  - 1. 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.
  - 2. 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.
  - 1. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
  - 1. Leave joints around framed wall openings void 1/4 inch to 3/8 inch in width and to a uniform depth of 3/4 inch.
- 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.
  - 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 "Through-Penetration Firestop Systems" and "Fire-Resistive Joint Systems."

### 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.
  - 1. Do not deeply furrow bed joints or slush head joints.
  - 2. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity.
    - a. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.
- C. Tool exposed joints slightly concave when thumbprint hard.
  - 1. At concrete unit masonry and concealed face brick, use a jointer larger than the joint thickness, unless otherwise indicated.
  - 2. At exposed face brick, use a 2-inch diameter jointer to form joints.
- 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 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.
  - 1. Use wood strips temporarily placed in cavity to collect mortar droppings.
    - a. 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.
    - a. After wall has been built to top of cavity and mortar has set, clean out cavity and then close temporary opening.
- B. Installing Cavity-Wall Insulation:
  - 1. Place small dabs of adhesive, spaced approximately 12 inches on center both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose.
  - 2. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways.
  - 3. Press units firmly against inside wythe of masonry or other construction as shown.
  - 4. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.
- C. Install air and vapor barrier over cavity wall-insulation in accordance with manufacturer's instructions.

### 3.8 MASONRY-CELL INSULATION

- A. At Service Building exterior walls, pour granular insulation into cavities to fill void spaces completely.
  - 1. Maintain inspection ports to show the presence of insulation at the extremities of each pour area.
  - 2. Close the ports after complete coverage has been confirmed.
  - 3. Limit the fall of insulation to 1 story in height, but not to exceed 20 feet.

### 3.9 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated.
  - 1. 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.
  - 2. Lap reinforcement a minimum of 6 inches.
  - 3. Space reinforcement not more than 16 inches on center.
  - 4. Space reinforcement not more than 8 inches on center in foundation walls and parapet walls.
  - 5. 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.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections.
  - 1. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.10 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.
    - a. 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 on center vertically and 36 inches on center horizontally.

### 3.11 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
  - 1. Fasten each anchor section through sheathing to wall framing with 2 metal fasteners of type indicated.
  - 2. Install through-wall flashing over each metal fastener onto air and vapor barrier specified in Division 5 Section "Cold-Formed Metal Framing."
    - a. Extend through-wall flashing 3 inches beyond center of metal fastener.
  - 3. Embed tie sections in masonry joints.
  - 4. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
  - 5. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  - 6. Space anchors as indicated, but not more than 16 inches on center vertically and 16 inches on center horizontally, with not less than 1 anchor for each 2 square feet of wall area.
    - a. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around the perimeter.

### 3.12 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated.
  - 1. Build-in related items as masonry progresses.
  - 2. 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 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."
  - 2. 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."
  - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

### 3.13 LINTELS

- 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 prefabricated or built-in-place masonry lintels.
  - 2. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout.
  - 3. Cure precast lintels before handling and installing.
  - 4. Temporarily support built-in-place lintels until cured.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

### 3.14 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. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
  - 1. Clean surfaces to receive adhesive side of flashing smooth and free from dust, dirt, oil, foreign matter, and projections which could damage flashing material.
    - a. Allow surfaces to dry.
  - 2. Install stainless steel drip edge using construction adhesive acceptable to flashing manufacturer.
    - a. Extend bent portion of stainless steel drip edge 1/4 inch beyond face of masonry.
  - 3. Prime surface to receive flashing using flashing primer at a rate recommended by flashing manufacturer.
  - 4. Where flashing is not continuous, such as above doors and windows, provide flashing manufacturer's pre-formed end dams in height equal to the masonry unit.
  - 5. Provide flashing manufacturer's pre-formed corners at inside and outside corners.
  - 6. Remove release paper and position through-wall flashing against surface.
    - a. Recess flashing 1/2 inch from outside vertical face of masonry.
    - b. Fully adhere flashing to substrate with steel hand roller.
    - c. Overlay adjacent pieces 4 inches and adhere with steel hand roller.

- d. Overlay end dams and corner units 4 inches and adhere with steel hand roller.
  - e. Seal penetrations with flashing manufacturer's recommended mastic.
  - f. Seal edges of overlaps with flashing manufacturer's recommended mastic.
  - g. Seal top edge of through-wall flashing with flashing manufacturer's recommended mastic.
  - 7. Turn flashing up not less than 6 inches above cavity wall netting.
    - a. At sheathing locations, secure and seal flashing to sheathing under air and moisture barrier, using flashing termination bar and flashing manufacturer's recommended mastic.
      - 1) Anchor flashing termination bar into metal framing at 16 inches on center.
    - b. At concrete block backup locations, extend flashing inner wythe to within 1/2 inch of the interior face of wall in exposed masonry.
      - 1) 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.
  - 8. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end.
    - a. At heads and sills, extend flashing 2 inches onto pre-formed end dams.
  - 9. Cover flashing with bed of mortar before placing masonry on flashing.
- D. Install one continuous roll of cavity drainage material directly over flashing.
- 1. Install with dovetail shaped section facing up.
  - 2. Cut cavity drainage material to accommodate wall ties, horizontal wall reinforcement, electrical conduit, and other penetrations.
- E. Place weep holes in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
- 1. Space weep holes 16 inches on center.
  - 2. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
  - 3. Keep weep holes and area above flashing free of mortar droppings.
- F. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- 3.15 REINFORCED UNIT MASONRY INSTALLATION
- A. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- B. 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.
- 3.16 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. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5,000 square feet of wall area or portion thereof.
- 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. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.
- F. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

3.17 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.
  - 1. 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.
  - 1. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance.
  - 2. 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.
    - a. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.
  - 4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.18 MASONRY WASTE DISPOSAL

- A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property.
  - 1. At completion of unit masonry work, remove from Project site.
  - 2. Comply with Division 1 Section "Construction Waste Management."

END OF SECTION 04810