

SECTION 04 05 00 - COMMON WORK RESULTS FOR MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Mortar and grout
2. Reinforcement
3. Ties and anchors
4. Miscellaneous masonry accessories
5. Insulation
6. Masonry cleaners

1.2 SUBMITTALS

A. Material Certificates:

1. Cementitious materials. Include brand, type, and name of manufacturer.
2. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
3. Grout mixes. Include description of type and proportions of ingredients.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.3 QUALITY ASSURANCE

A. Masonry Construction And Materials: Comply with requirements of "Specification for Masonry Structures (ACI 530.1-05/ASCE 6-05/TMS 602-05)" except as modified by the requirements of these Contract Documents.

B. Mock-Up: Build mock-up panel to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Build mock-up approximately 72 inches (1829 mm) long by 48 inches (1200 mm) high. Panel to represent exterior wall including different types of masonry (whether specified in this section or not), mortar and sealant to represent completed masonry work for qualities of appearance, materials and construction to be approved by the Owner's Representative.
 - a. Locate mock-up where directed by Owner's Representative.
 - b. Include reinforcing and minimum one control joint and one outside corner.
 - c. Clean 1/2 of mockup to represent final clean down. Leave other half uncleaned for comparison purposes.
 - d. Leave mock-up in place until Project completion.

1.4 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.
- B. 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. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
- C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- D. Do not place masonry units directly on the ground while being stored.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

- A. Masonry Cement: ASTM C 91.
 - 1. Products:
 - a. Cemex, Inc.; Richmortar; 800-451-6771.
 - b. Essroc, Italcementi Group; Flamingo Brixment; 800-437-7762.
 - c. Lehigh Cement Company; Lehigh Masonry Cement; 800-523-5488
 - d. The Quikrete Companies; Mason Mix; 404-634-9100
 - e. SPEC MIX, Inc. Spec Mix Masonry Cement, 888-773-2649
- B. 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.
 - 1. Products:
 - a. Cemex, Inc.; Cemex PCL.
 - b. Essroc, Italcementi Group; Saylor's Plus.
 - c. Lehigh Cement Company; Lehigh PCL.
 - d. The Quikrete Companies; Quickcrete PCL.
 - e. SPEC MIX, Inc. Spec Mix PCL.
- C. Aggregate for Mortar: ASTM C 144.
- D. Mortar Colors: To Match adjacent. As specified in Division 01 Section "Exterior Finishes and Colors."

- E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Products: Provide one of the following or an approved substitution:
 - a. Euclid Chemical Company; Accelguard 80.
 - b. Grace Construction Products, W.R. Grace & Co. - Conn.; Morset.
- F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer or compatible with integral water repellent in concrete block.
- G. Water: Potable.

2.2 GROUT MATERIALS

- A. 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, Type S.
 - 1. Products:
 - a. Cemex, Inc.; Cemex PCL.
 - b. Essroc, Italcementi Group; Saylor's Plus.
 - c. Lehigh Cement Company; Lehigh PCL.
 - d. The Quikrete Companies; Quickcrete PCL.
 - e. SPEC MIX, Inc. Spec Mix PCL.
 - 2. Masonry cement grout is not allowed.
- B. Aggregate for Grout: ASTM C 404.
- C. Water: Potable.

2.3 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, **Grade 60 (Grade 420)**.
- B. Horizontal Joint Reinforcing: ASTM A 951
 - 1. Single Wythe Concrete Masonry.
 - a. Type: ladder type.
 - b. Wire Size: 9 gage, W1.7 or **0.148-inch (3.8-mm)** diameter.
 - c. Spacing: **16-inch (406.4-mm)** centers vertically unless noted otherwise.
 - d. Hot dipped galvanized per ASTM A153 class B.
 - e. Lap horizontal joint reinforcing **6-inches (152-mm)** minimum. Horizontal joint reinforcing shall be discontinuous across movement joints.

2. Provide prefabricated “L” and “T” shaped horizontal joint reinforcing at wall intersections.

2.4 TIES AND ANCHORS

A. Materials:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Masonry Veneer Anchors: Two-piece assemblies which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane of wall; consisting of wire tie section and metal anchor section for attachment over sheathing to metal studs and complying with the following requirements:

1. Wire: 0.1875 inch (4.75 mm) diameter, length as required to extend within 1 inch (25.4 mm) of masonry veneer face.
2. Anchor Section: Tee shaped rib stiffened sheet metal plate; 14 gage, 0.747 inch (19 mm) by minimum 2-3/4 inch (69.85 mm) by 3 inches (76 mm) high.
3. Metal Fasteners for Steel Studs: Steel drill screws, #10 diameter by length required to penetrate steel stud flange by not less than (3) exposed threads, complying with ASTM C-954, except with hex washer and neoprene washer, cadmium-plated.
4. Acceptable Products:

a. Non-Seismic Masonry Veneer Anchors:

- 1) Holmann & Barnard, Inc.: HB213.
- 2) Wire-Bond; RJ-711.

C. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.4 mm) thick by 24 inches (600 mm) long, with ends turned up 2 inches (50 mm) or with cross pins.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

- D. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch (9-mm) OD by 4 inches (100 mm) long.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity, minimum 10 inches (250 mm) wide
 - 1. Products:
 - a. Advanced Building Products Inc.; Mortar Break.
 - b. Archovations, Inc.; CavClear Masonry Mat.
 - c. Hohmann & Barnard, Inc; Mortar Trap.
 - d. Mortar Net Solutions; Mortar Net.

2.6 INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, closed-cell product extruded with an integral skin.
- B. Foamed-In-Place Masonry Insulation: Two component thermal insulation consisting of an amino-plast resin and catalyst foaming agent surfactant.
 - 1. Products:
 - a. cfiFOAM, Inc.; Core Foam Masonry Insulation; 800-656-3626
 - b. Polymaster Inc.; R501; 800-580-3626.
 - c. Tailored Chemical Products, Inc; Core-Fill 500; 800-627-1687.
 - 2. Surface Burning Characteristics: ASTM E 84, Class A.
 - a. Flame Spread: Maximum 25.
 - b. Smoke Developed: Maximum 450.
 - 3. Combustion Characteristics: Noncombustible per ASTM E 136.or heat of combustion per NFPA 259.
 - 4. R-value: 4.0 per inch at 75 degrees F per ASTM C 177.

2.7 WATER REPELLANTS

- A. Provide water repellants as specified in Division 07 Section "Water Repellants."

2.8 MASONRY CLEANERS

- A. Products: Provide one of the concentrated, general-purpose acidic cleaner products specified for each type of masonry listed below. Use only the products specified for the specific type of masonry. Do not use products for other types of masonry units specified unless approved by the Owner. On wall surfaces with multiple types of masonry, use mildest product specified for types of masonry used on wall surface. Obtain approval from Owner.

1. Clay Brick, Standard CMU:
 - a. Diedrich Technologies, Inc.; 202 New Masonry Cleaner; 800-323-3565
 - b. ProSoCo, Inc.; Sure Klean 600 Detergent; 800-255-4255.
2. Decorative Concrete Block:
 - a. Diedrich Technologies, Inc.; Specialty Masonry Cleaner; 800-323-3565
 - b. ProSoCo, Inc.; Sure Klean Custom Masonry Cleaner; 800-255-4255.
3. Decorative Concrete Brick: Concentrated, general-purpose acidic cleaner
 - a. Diedrich Technologies, Inc.; 222 Cast Stone & Burnished Masonry Cleaner; 800-323-3565
 - b. ProSoCo, Inc.; Sure Klean Concrete Brick Cleaner; 800-255-4255.
4. Cast Stone: Concentrated, general-purpose acidic cleaner
 - a. Diedrich Technologies, Inc.; 222Cast Stone & Burnished Masonry Cleaner; 800-323-3565
 - b. ProSoCo, Inc.; Sure Klean Burnished Custom Masonry Cleaner; 800-255-4255.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
3. Add water repellent admixture to mortar used with masonry units manufactured with integral water repellent.
4. Accurately measure mortar and grout proportions prior to mixing. Add cement to mix in full bag quantities. Measure sand in box with volume of one cubic foot as often as necessary to maintain consistent proportions and at least once daily and every 4 hours of mixing.
5. Preblended, Dry Mortar Mix: At Contractor's option, dry mortar ingredients may be furnished in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated:

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type N.
3. For exterior, above-grade, non-reinforced load-bearing walls, use Type N.
4. For exterior non-load-bearing walls and parapet walls, Use Type N.
5. For interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
6. For exterior above grade veneer, use Type N.

C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in 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 (200 to 280 mm) as measured according to ASTM C 143/C 143M.
3. Do not use fly ash in grout.
4. Provide either Project-site mixed grout or ready-mixed grout.
 - a. For ready-mixed grout, measure, batch, mix, and deliver grout according to ASTM C 94/C 94M, and furnish batch ticket information.
 - b. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 1. Mix units from at least 3 pallets or cubes as they are placed.
- C. Bond Pattern for Exposed Masonry:
 1. Install masonry units in the bond pattern indicated or if not indicated in running bond pattern.
 2. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation, except for grout. Do not install masonry below 25 deg. F (-4 deg. C). For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected with 10 deg. F (-12 deg. C).
 1. 40 deg. F (4 deg. C) to 32 deg. F (0 deg. C):
 - a. Mortar: Heat mixing water to produce mortar temperature between 40 deg. F (4 deg. C) and 120 deg. F (49 deg. C).
 - b. Grout: Follow normal masonry procedures.
 2. 32 deg. F (0 deg. C) to 25 deg. F (-4 deg. C):

- a. Mortar: Heating mixing water and sand to produce mortar temperatures between **40 deg. F (4 deg. C)** and **120 deg. F (49 deg. C)**; maintain temperature of mortar on boards above freezing.
 - b. Grout: Heat grout to **90 deg. F (32 deg. C)** to produce in place grout temperature of **70 deg. F (21 deg. C)** at end of work day.
3. Do not heat water for mortar and grout above **160 deg. F (71 deg. C)**.
- E. Protect completed masonry and masonry not being worked on as follows. Temperature ranges indicated apply to mean daily air temperatures, except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.
1. **40 deg. F (4 deg. C)** to **32 deg. F (0 deg. C)**: Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
 2. **32 deg. F (0 deg. C)** to **25 deg. F (-4 deg. C)**: Completely cover masonry with weather-resistive membrane for at least 24 hours.
- F. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.

3.2 LAYING MASONRY WALLS

- A. Cut exposed masonry units, where necessary, with a power saw. Avoid the use (by proper layout) of less than half size units.
- B. Bond intersecting walls with masonry units or provide anchors spaced **2 feet (609.6 mm)** on center.
- C. Hold uniform joint sizes as indicated, or if not indicated, hold joint sizes to suit modular size of masonry units.
- D. Cut joints flush and tool with joint tool.
- E. Reinforce horizontal joints with continuous masonry wire reinforcing, spaced **16 inches (406.4 mm)** on center vertically.
 1. In parapet walls and immediately above and below openings, for a distance of **24 inches (609.6 mm)** beyond jambs of opening, space horizontal joint reinforcement at **8 inches (203.2 mm)** on center. Do not bridge control and expansion joints in the wall system.
- F. Anchor ends of walls to structure with anchors spaced **24 inches (609.6 mm)** on center, except as otherwise shown.

- 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. Provide movement (control and expansion) joints at locations shown, and keep clean of mortar droppings.
 - 1. Movement Joints in Concrete Masonry Units: Sash block unit with preformed shear key. Caulk both faces. Alternate details for control joints may be acceptable when submitted for approval.
 - 2. Movement Joints in Clay Brick: **3/8 inch (9.5 mm)** wide clean joint filled with expansion joint material per ASTM D1056, Class RE 41. Caulk exterior face.
 - 3. Bond beams shall be discontinuous across movement joints unless noted otherwise.
 - 4. Provide building paper bond break below lintel bearing adjacent to control joints.
- I. Provide concealed exterior masonry flashing and weep/vents as indicated.
 - 1. 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.
 - 2. Provide weep holes spaced **24 inches (609.6 mm)** on center at the bottom of (and at ledges in) exterior walls and at flashing at bond beams.
 - 3. Except as otherwise shown, provide flashing under copings and sills, through wall at counter flashing locations, and above elements of structural support for masonry and at bond beams in exterior walls.
 - a. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing as recommended by flashing manufacturer.
 - b. At lintels and shelf angles, extend flashing a minimum of **6 inches (150 mm)** into masonry at each end. At heads and sills, extend flashing **6 inches (150 mm)** at ends and turn up not less than **2 inches (50 mm)** to form end dams.
- J. Build other work into the masonry work as shown, fitting masonry units around other work, and grouting for secure anchorage.
- K. Protect newly laid masonry from exposure to precipitation, excessive drying, freezing, soiling, backfill and other harmful elements.
- L. Clean exposed masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.

3.3 MASONRY-CELL INSULATION

- A. Masonry-Cell Insulation: Drill holes in CMU face shell or in mortar joint around entire wall area approximately **5 feet (1.52 m)** from floor level. Repeat at height no greater than **15 feet (4.57 m)** in vertical height until completion of wall area fill cores completely with foam insulation. Patch holes flush to match adjacent material.

3.4 REINFORCED UNIT MASONRY INSTALLATION

- A. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
 - 1. Support and fasten reinforcing steel to approved positioners located at 192 bar diameters maximum spacing and with a minimum of two positioners per grout pour (one near the bottom and one near the top) to prevent displacement during the placement of grout.
 - 2. Provide reinforcing bar splices as specified on the Drawings. Bar splice couplers may be considered as a substitute when submitted for approval.
- B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).
 - 3. Grout cells below grade solid.

3.5 WATER REPELLANT INSTALLATION

- A. Apply water repellant to the following masonry surfaces as specified in Division 07 Section "Water Repellants:"
 - 1. Unpainted exterior standard concrete unit masonry.
 - 2. Decorative concrete block unit masonry.
 - 3. Any other surfaces as indicated on the Drawings.

3.6 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Mortar Testing: Comply with ASTM C 270 for batch mixed and ASTM C 780 for field mix.
- D. Grout Testing: Comply with ASTM C 1019 for either batch mixed or field mix.
- E. Testing Frequency (for both Mortar and Grout): One set of tests for each 2500 sq. ft. (232 sq. m) of wall area or portion thereof.

1. Set of Tests: Three cubes minimum, one tested at 7 days, one at 14 days and one at 28 days.
- F. Site structural observation (not considered special inspection): ACI 530.1-05/ASCE 6-05/TMS 602-05.
1. Site observations will be made by the Architect or an alternate approved by the Owner. Payment for these services will be made by Owner. Request for observation is the responsibility of the Contractor. The site observer shall verify compliance with the design drawings and specifications and any additional requirements to comply with the local jurisdiction and keep a record which will cover:
 - a. Quality of masonry units and materials for mortar and grout.
 - b. Proportioning, mixing and consistency of mortar and grout.
 - c. Laying, mortaring and grouting of masonry units and masonry structural elements.
 - d. Conditions, grade, size, spacing and placing of reinforcing.
 - e. Type, spacing, and placing of ties and accessories.
 - f. Any significant or unusual construction loads on completed masonry structural elements.
 - g. Temperature, moisture conditions, and provisions that were made for hot or cold weather construction.
 - h. General progress of work.
 2. The Owner shall make continuous observations of grouting procedure to assure that Portland Cement Lime grout is used to fill cores around reinforcement.

3.7 CLEANING

- A. After mortar is thoroughly set and cured, clean masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
 2. Test cleaning methods on sample panels before proceeding with cleaning of entire masonry work.
 3. Protect adjacent surfaces including surfaces of different types of masonry as applicable by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 5. Clean masonry with specified proprietary acidic cleaner applied according to manufacturer's written instructions.
 - a. Work from top to bottom.
 - b. Apply on small sections at a time.
 - c. Immediately rinse with water after cleaning.
- B. Do not use high pressure cleaning methods.
1. Do not exceed nozzle pressure of 500 psi.
 2. Use water flow of at least 4 gallons per minute.

3. Use at least 40 degree fan nozzle.
 4. Keep nozzle at least 18-inches from face.
- C. Cleaned surfaces shall appear as represented by mock-up.

END OF SECTION 04 05 00