

Section 04200

BUILDING MASONRY

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installing of building masonry.

1-2. GENERAL. Building masonry shall be constructed of units of the types, dimensions, arrangements, and coursing indicated on the drawings and specified herein, complete with all materials, accessories, and appurtenances indicated and specified, or as required.

1-3. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.

All masonry units shall be handled in a manner which will prevent soiling, chipping, or damage of any kind. Broken, discolored, chipped, or otherwise damaged facing units will be rejected and shall be replaced with undamaged units.

Masonry units shall be stored on pallets, shall be protected against contamination and staining, and shall be kept covered and dry at all times. Lime and cement shall be stored under cover in a dry place.

Sand shall be stored so that the inclusion of foreign materials is prevented. Whenever sand is piled directly on the ground, the surface beneath the sand shall be smooth, well drained, and free from dust, mud, and debris. The bottom 6 inches of each pile shall not be used in mortar.

Insulation shall be stored under cover in a dry place, and shall be protected from the weather at all times.

1-4. SUBMITTALS. Before masonry construction is begun, the following drawings, data, specimens, and samples shall be submitted in accordance with the Submittals section. Additional data shall be submitted as needed. If the source of a material is changed during the course of the work, the tests and reports required for preliminary review of that material shall be resubmitted.

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Specimens, performance data, and color selection kits for all masonry units which will be used in project construction, showing range of colors, textures, finishes, and dimensions.

Types and proportions of the ingredients of the mortar and grout mixtures.

Manufacturer information and data for any admixture, mortar coloring, or product added to the grout or mortar.

Color selection sample kits for integral mortar colors.

One sample, at least 6 inches long, of each type of nonmasonry joint material required.

Shop drawings or manufacturers' literature showing details of anchors, ties, and metal accessories to be used in masonry construction.

Bar lists and drawings for the fabrication and placement of reinforcement with sufficient elevations and sections to adequately detail and label all reinforcement.

Cold and hot weather construction procedures.

The manufacturer of the masonry units shall submit a letter of certification at the time of, or prior to, delivery of the units to the jobsite to verify the units comply with the requirements of this specification.

The supplier of grout shall submit a letter of certification at the time of, or prior to, delivery of the grout to the jobsite to verify the grout complies with the requirements of this specification.

1-5. COLORS AND SAMPLES. Colors of masonry units and colored mortar will be selected to match the existing structure.

1-5.01. Masonry Units. Colors for integral colored masonry units shall match the existing building. General color selections shall be made from manufacturer's data. After general color selections are made, sample masonry boards shall be submitted to Engineer for preliminary color selections. These boards shall be of sufficient size to show the proposed shade distribution and shall be submitted in as many different colors, textures, arrangements, and shade combinations as may be required for making a proper selection. Boards shall be at least three courses high and three stretcher units wide laid up in running bond. Units need not be full depth. The preliminary color and texture selections shall be used for submitting the full size units and in constructing the sample panels specified herein. All color, shade, and texture selections shall not be final until the field constructed sample panel has been accepted.

1-5.02. Marble and Granite. Not used.

1-5.03. Limestone. Not used.

1-5.04. Glass Block. Not used.

1-5.05. Mortar. Integral mortar color will be selected from sample kits submitted. After general color selections have been made, mortar samples shall be prepared for color selection. As many samples as are necessary to make a proper selection shall be prepared. Preliminary color selections shall be used in constructing the sample panels. Mortar colors shall not be final until the sample panels have been accepted.

1-5.06. Samples. Samples of all masonry units and mortar shall be submitted as indicated in the Submittals section. At least two samples of each type of unit required shall be submitted.

1-5.07. Sample Panels. Before the installation of any masonry materials, sample panels shall be constructed at the building site incorporating each type of masonry material. Sufficient number of sample panels shall be constructed to show each type of exterior and interior wall configuration and bonding patterns indicated on the drawings. Unless otherwise indicated or detailed on the drawings, sample panels shall be 6'-8" long by 4'-0" high. Sample panels shall show the proposed color range, texture, bonding patterns, mortar joints, mortar color, and workmanship for masonry materials. Each panel shall be of the thickness indicated on the drawings for building walls of similar construction. The panels shall be representative of each typical exterior and interior masonry wall construction indicated on the drawings complete with, as applicable, masonry units, bonding patterns, joint reinforcement, wall ties, wall insulation, vertical steel, a typical bond beam, mortar color, mortar tooling, weeps, and flashings. Each sample panel shall include a typical control joint complete with filler strips and caulking as indicated on the drawings. The sample panels shall not be incorporated into the work. No masonry work shall progress until Engineer has accepted the sample panels. The panels shall then become the standard of comparison for all masonry work built of the same materials. The panels shall not be destroyed or moved until all masonry work is completed.

When masonry waterproofing or stain is specified in another specification section, the sample panels shall include the application of the specified material and shall be included in Engineer's acceptance.

1-6. BRICK ALLOWANCE. Not used.

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1-7. MASONRY PRISM TESTS. The design compressive strength of masonry, f_m shall be based on prism tests as specified below.

Contractor shall construct a set of five masonry prisms in accordance with ASTM C1314 modified in accordance with ACI 530.1 (UBC Standard 21-17), from the materials specified. Prisms shall be constructed under observation of Engineer, special inspector, or testing laboratory personnel.

The masonry prisms will be tested by the testing laboratory in accordance with the specified standards. Samples will be transported and tests made at the expense of Owner.

Masonry construction shall not begin until the specified masonry compressive strength, f_m , has been verified by prism testing.

PART 2 - PRODUCTS

2-1. MATERIALS. All acceptable masonry products are indicated below. Products necessary for the work are as specified or as indicated on the drawings. Sizes of masonry units are nominal, the actual size being slightly smaller to allow for mortar joints.

Concrete Block

ASTM C90, (UBC Standard 21-4), 8 inch x 16 inch face dimensions, sizes with special shapes as indicated on the drawings; lightweight or regular aggregate conforming to ASTM C331 or C33.

Split Face Type

Integral color units or as indicated on the drawings with integral moistureproofing admixture; full face, single scored, bond beam units, and other required special units as indicated on the drawings.

Color Range

Tans.

Texture

Random broken face.

Scoring

No score.

Ground Face Type	Integral color units or as indicated on the drawings, ground and polished, with integral moistureproofing admixture; full face, single scored or multiple scored units, with special corner units, bond beam units, and other special units as indicated on the drawings.
Color Range	Tans.
Texture	Ground face.
Scoring	No score.
Concrete Brick	ASTM C55 (UBC Standard 21-3), Type I, Grade N-I, moisture-controlled units.
Sand	ASTM C144, natural sand.
Pea Gravel	ASTM C33, coarse aggregate, 90 percent passing 3/8 inch sieve, 90 percent retained on No. 4 sieve.
Portland Cement	ASTM C150, Type I.
Hydrated Lime	ASTM C207, Type S.
Quicklime	ASTM C5, pulverized.
Lime Putty	Quicklime, thoroughly slaked and stored for one day; kept moist until used.
Integral Mortar Color	ASTM C979, mineral pigments, natural or synthetic iron oxides, sun fast and water resistant, free of fillers and extenders. Soloman Grind-Chem Service, Inc. "A", "H", or "X" series.
False Joint Mortar	ANSI A118.4, Type S, Portland cement mortar with latex admixture, color to match mortar color.

Integral Waterproofing	Aluminum stearate, ammonium stearate, or calcium stearate, 2 percent of weight of cement; W. R. Grace "Dry Block Mortar Admixture", A. C. Horn "Hydratite", or Sonneborn "Hydrocide".
Water	Clean and free from deleterious substances.
Joint Reinforcement	Dur-O-Wall or Hohmann and Barnard; fabricated from cold drawn steel wire, ASTM A82; galvanized, ASTM A153, Class B-2; type as indicated on the drawings with prefabricated corners and tees.
Ladder Type	Two-rod and three-rod types as indicated on the drawings.
Standard Weight	9 gage side rods and cross rods.
Reinforcing Steel	ASTM A615, Grade 60, except No. 3 bars which may be either Grade 40 or Grade 60, deformed.
Loose Fill Insulation	Granular perlite, ASTM C549, or vermiculite, ASTM C516, treated for water repellency; Grace "Zonolite" or Frefco "Permalite".
Control Joint Material	ASTM D1056, Type 2, Class A-1, PVC foam with pressure-sensitive adhesive back; Dur-O-Wall "Rapid Soft-Joint" or Hohmann & Barnard "NS" Neoprene.
Wicks	Nylon or polypropylene sash cord, 1/4 inch in diameter.

Detergent Masonry Cleaner

Molded PVC type weephole
for vertical mortar joint;
Hohmann & Bernard "343".

ProSoCo "Vana-Trol" or
National Chem-Search "DC-6",
unless otherwise recom-
mended by the masonry unit
manufacturer and accepted
by Engineer.

Wall flashings are covered in the Sheet Metal section.

2-2. MORTAR. The method of measurement of all mortar ingredients shall be accurate and shall ensure definite and uniform proportions. All mortar ingredients shall be mixed on site. The use of masonry cement or premixed ingredients will not be acceptable, unless authorized by Engineer.

2-2.01. Masonry Mortar. Masonry mortar shall conform to ASTM C270, except as modified herein. Mortar shall be machine mixed for at least 5 minutes and shall be used within 90 minutes after mixing. Mortar left when work is stopped shall be discarded. Remixing of mortar more than 90 minutes old with additional water, cement, or other materials will not be acceptable.

Unless otherwise indicated, mortar shall be cement-lime Type S, and shall conform to the proportion specifications of ASTM C270.

The sand content specified above is maximum quantity. Integral waterproofing shall be added to each mortar mixture.

2-2.02. Integral Mortar Color. Integral mortar coloring shall be added to the mortar for masonry as specified herein. All other joints shall be standard gray mortar. Integral mortar coloring shall be added to the mortar mix as recommended by the mortar color manufacturer. The manufacturer's mixing instructions and proportions shall be strictly adhered to. Each mortar color shall be of consistent color throughout the project. Mortar shall be mixed in a power mixer until a uniform color is obtained, but not less than 5 minutes.

Where indicated on the drawings, latex modified joint grout for false joints in scored concrete masonry units shall be colored to match mortar color.

2-3. GROUT FILL. Grout fill for filling bond beams and other reinforced masonry shall be concrete grout meeting the requirements of ASTM C476 . Grout shall be coarse and shall be proportioned by volume in accordance with Table 1 of

ASTM C476. Only enough water shall be added to produce a mixture which is flowable, but which will not show an excess of water when placed. Unless otherwise specified, grout fill shall have a slump ranging from 8 to 11 inches.

PART 3 - EXECUTION

3-1. **MORTAR JOINTS.** Masonry shall be laid in straight, level, uniform courses, with mortar joints of uniform width. Head joints shall approximately equal the horizontal joints in width.

Joints shall be tooled smooth and concave before mortar takes final set. Surplus mortar shall be removed from faces of concrete blocks at the time joints are struck or tooled, using a clean, wet sponge or nonabrasive scrub brush and wipe dry.

3-2. **BONDING AND REINFORCING.** Except where otherwise indicated on the drawings, all concrete block shall be laid in running bond. All masonry shall be reinforced and anchored as indicated on the drawings and as specified herein.

3-2.01. **Joint Bonding and Reinforcing.** Horizontal masonry units shall be bonded and reinforced as specified, unless otherwise indicated on the drawings. Joint reinforcing shall be discontinuous at control and expansion joints. Prefabricated corner and tee pieces shall be used at corners and tees indicated to be continuous on the drawings.

Unless otherwise specified, all concrete block masonry shall be bonded and reinforced with continuous ladder type joint reinforcement spaced not more than 16 inches apart vertically. The joint reinforcement shall have one longitudinal rod at each face shell of the masonry units. Continuous ladder type joint reinforcement may be omitted in concrete block walls with reinforced bond beams at not more than 24 inches on centers.

Adjustable type reinforcement may be used only if specifically indicated on the drawings.

Masonry parapets shall be reinforced with heavy-duty continuous joint reinforcement or reinforcing steel as indicated on the drawings.

Except where a top bond beam is indicated on the drawings, the top three courses of all masonry walls, including backup, shall have continuous joint reinforcement placed in each joint (8 inch on centers). Joint reinforcement shall be terminated at expansion joints and control joints. Openings in masonry walls

shall have joint reinforcement placed in the two courses immediately above lintels and in the two courses immediately below all sills. Joint reinforcement shall extend 24 inches past openings on each side.

The width of joint reinforcement (side rod to side rod) in each case shall be approximately 2 inches less than the nominal overall thickness of the wall in which it is placed. All joint reinforcement shall be fully embedded in mortar and shall be covered with at least 5/8 inch of mortar on the exterior face.

The ends of sections of joint reinforcement shall be lapped at least 8 inches. At corners and intersections, prefabricated corners and tees shall be used.

3-2.02. Masonry Anchorage. The extent and details of masonry anchorage to abutting structure or backup construction shall be as indicated on the drawings and as specified.

3-2.03. Reinforcing Steel. Concrete block bond beam units shall be provided, installed and reinforced with reinforcing steel where required and as indicated on the drawings. Bond beam units shall be filled with grout fill as specified herein. Reinforcing steel shall be continuous around corners. At expansion joints, all bond beam reinforcing shall be discontinuous. At control joints, 50 percent of the bond beam reinforcing shall be discontinuous unless otherwise indicated on the drawings.

Vertically reinforced concrete block cores shall be provided as indicated on the drawings. Reinforcing shall be accurately placed and securely tied to prevent shifting during core filling. Bar positioners shall be used for alignment. Positioners shall be placed in the bottom and top courses of walls and at not more than 4 feet centers between. Mortar fins which project into cores more than 1/2 inch and all loose mortar and debris shall be removed before filling the cores. Cores shall be filled with grout fill as specified herein.

Special bond beam units with open or knockout webs and open vertical cells shall be used for bond beams. U-shaped lintel units shall be used only in bond beams over openings. If the cells beneath a bond beam are not required to be grouted, wire mesh material may be used in the joint to retain the grout fill.

3-2.04. Grout Fill. Unless otherwise acceptable to Engineer, grout fill shall be placed in lifts not to exceed 5 feet. Pours exceeding 12 inches in height shall be consolidated by mechanical vibration and reconsolidated after initial water loss and settlement. Bond beam fill shall not be mechanically vibrated. Grout fill shall be placed in reinforced block cores, bond beams, lintels, and in other locations indicated on the drawings.

When required, or when indicated on the drawings as grout filled or grouted solid, concrete block masonry walls shall be completely filled with grout as specified.

All concrete block masonry in Seismic Risk Zones 3 and 4 or in Seismic Categories C, D, or E shall be grouted solid.

3-3. LAYING MASONRY UNITS. All masonry units shall be free from dust, dirt, and surface moisture when laid. Concrete blocks shall be dry when laid.

All masonry shall be laid to a line. Walls shall be plumb and straight and in level courses. At no time shall any part of masonry construction project more than 8 feet above adjacent work. When work is suspended, the tops of exterior masonry walls shall be covered and protected from the weather.

Care shall be taken in corner construction and at jambs to maintain uniformity of appearance and to ensure that only whole, undamaged units are used. All patterned masonry units shall have special corner units installed at exposed corners to maintain consistency of patterns.

Unless otherwise indicated on the drawings, concrete block shall have bullnose units installed at door jambs, louver jambs and sills, and all exterior corners.

Units laid in stack bond or soldier coursing shall be carefully plumbed, so that vertical joints will form uniform, continuous vertical lines of uniform width, texture, and general appearance. Units shall be of uniform length and shall be trimmed as necessary. Facing brick in stack bond, patterns, or soldier coursing shall be selected to meet the dimensional tolerances and chippage limitations of ASTM C216 for Type FBX brick. Short closure pieces shall not be used in stack bond.

Unless otherwise indicated, masonry units laid in running bond in exposed locations shall be so constructed that vertical joints in alternate courses lie in the same vertical lines, midway between the vertical joints in adjacent courses to provide a regular and uniform joint pattern. All custom scored units shall be aligned as detailed on the drawings.

Masonry units shall be saw-cut to provide openings and to accommodate embedded items. Anchors shall be securely embedded in mortar. Door and window frames shall be maintained plumb and true. Masonry shall be built tightly against interior door frames. A caulking space shall be provided between exterior door frames and masonry in accordance with the details indicated on the drawings. The jambs of built-in hollow metal door frames shall be completely filled with grout fill or mortar.

Lintels shall be provided over all openings wider than the length of a masonry unit. Lintels shall be of the types and sizes indicated on the drawings or as needed, and shall be acceptable to Engineer. Lintels longer than 3 feet shall bear on solid masonry units or on grout-filled cells of hollow units at least one masonry course in height, unless otherwise indicated on the drawings.

Reinforced lintels and other wall reinforcing as needed and indicated on the drawings shall be provided and installed hereunder. Reinforced lintels shall be filled with grout fill.

All embedded items shall be set and securely anchored in the masonry work as indicated on the drawings or as acceptable to Engineer. Joints between masonry and embedded items shall be pointed.

Where indicated on the drawings, the unfilled cores of concrete block or glazed block walls shall be filled with loose insulation. The insulation shall be poured into the space as the work progresses, with care taken to fill all spaces and voids.

Masonry units shall be selected and laid so that the exposed face of each unit is free of broken corners, chipped edges, or other defects which would be detrimental to the appearance of the wall surface.

3-4. FLASHINGS. Wall flashings shall be installed where and as indicated on the drawings. Flashings in horizontal joints shall be in the center of the joints, with mortar below and above them and shall extend to within 3/8 inch of the exterior masonry face unless otherwise indicated on the drawings. Flashings shall drain toward the exterior surface of the wall. Weeps consisting of wicks installed when the masonry is laid shall be provided at not more than 2 foot centers and shall be cut off flush after the mortar has set.

3-5. CONTROL JOINTS. Control joints in masonry walls and in masonry walls abutting concrete wall surfaces shall be constructed as indicated on the drawings. Where required, joint filler strips shall have a thickness equal to at least 1-1/2 times the nominal width of the joint. The filler strips shall be firmly bonded to one joint face by the adhesive backing, and shall be of required width to be held back 1/2 inch from each face for caulking, and placed under compression by the abutting masonry. All joints in filler strips shall be tightly butted.

3-6. ANCHORS, INSERTS, AND OTHER PENETRATIONS. All necessary ties, anchors, bolts, inserts, bucks, flashings, sleeves for piping, conduits of every

kind, window and door frames, and other work shall be accurately set and securely held in the masonry work as indicated on the drawings or in a manner acceptable to Engineer. Sleeves shall be provided where small piping passes through the masonry.

Unless noted otherwise on the drawings, structural shapes, joists, and decking passing through or over the masonry, but not bearing on the masonry, shall be isolated from the masonry as specified or as indicated on the drawings. At a minimum, a 1 inch expansion joint shall separate the structure from the masonry. This separation is not applicable at appurtenances specially designed to provide lateral support from the structure or decking to the masonry.

3-7. LOW TEMPERATURES. When the temperature of the surrounding air is below 40°F, or when the outdoor temperature is likely to fall below freezing at any time during the 24 hour day, the following precautions shall be taken to prevent freshly laid masonry from freezing:

- a. In addition to the protection specified for ordinary conditions, masonry materials shall also be kept from contact with snow, ice, or dampness of any kind.
- b. The temperature of the mixed mortar shall be between 70 and 120°F. Mixing water shall be warm, but not above 165°F. If necessary, sand shall be heated also. Mortar mixing equipment shall be heated before it is used. The use of salt or calcium chloride is not acceptable.
- c. Masonry units shall be free of ice and snow and shall be above freezing when laid. If the outdoor temperature is below 30°F units shall be heated to at least 40°F. If the temperature is below 0°F, units shall be heated to at least 60°F. Heating shall be done so that the units are not damaged.
- d. Masonry units shall not be laid on surfaces that are frozen or covered with snow or ice.
- e. Masonry laid during freezing weather shall be kept warm for at least 3 days after laying. The air temperature at the masonry surface shall be kept between 45°F and 90°F, using heating methods that will not unduly dry out or otherwise damage the masonry. Heat shall be applied to both sides of the wall, with provisions for proper circulation of air. The masonry shall be suitably housed or covered.

3-8. HIGH TEMPERATURES. When the ambient air temperature exceeds 99°F in the shade and the relative humidity is less than 50 percent, masonry shall be protected from direct exposure to wind and sun during and for 48 hours after erection.

3-9. FINISH TUCK POINTING. On completion of the work, all exposed masonry shall be pointed where necessary and all voids and holes in the mortar shall be filled to match adjacent joint surfaces. Defective joints shall be cut out and repointed with mortar. Care shall be taken to produce a uniform overall appearance. Spottiness due to variations in either materials or workmanship will not be acceptable.

3-10. PAVING BRICK. Not used.

3-11. PROTECTION FROM DAMAGE. Masonry and all embedded or built-in items shall be carefully protected from damage. Masonry walls discolored by paint, mortar, or concrete shall be rebuilt with new materials.

Where concrete is placed adjacent to or on top of previously constructed masonry, the masonry shall be adequately protected against splashing of concrete paste and from other damage.

3-12. CLEANING. Following finish pointing, all exposed masonry surfaces shall be cleaned to remove all surface stains and smears.

Mortar smears or droppings on concrete blocks shall be removed with a steel trowel after they have hardened to the extent that removal will not cause additional smearing. Any remaining mortar shall be removed to the extent possible by rubbing with a small piece of block. All surfaces shall then be thoroughly brushed.

If stains and smears cannot be removed by the specified methods, Contractor may propose alternative methods or cleaning products. These alternatives shall be acceptable to Engineer before they are used.

3-13. OWNER'S FIELD CONTROL TESTING. No field control tests are required.

End of Section

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