

SPECIFICATIONS - DETAILED PROVISIONS
Section 04220 - Concrete Masonry Units

C O N T E N T S

PART 1 - GENERAL	1
1.01 DESCRIPTION.....	1
1.02 QUALITY ASSURANCE.....	2
1.03 SUBMITTALS.....	2
1.04 PROTECTION	2
1.05 COORDINATION	2
1.06 SCAFFOLDING.....	3
1.07 DELIVERY AND STORAGE.....	3
PART 2 - PRODUCTS	3
2.01 MATERIALS.....	3
2.02 MORTAR AND GROUT	5
PART 3 - EXECUTION	6
3.01 EXISTING CONDITIONS.....	6
3.02 PLACING REINFORCING.....	7
3.03 INSTALLATION, GENERAL.....	7
3.04 INSTALLATION OF REINFORCED CONCRETE MASONRY UNIT (CMU).....	10
3.05 CLEAN-UP AND REWORK	12

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SECTION 04220
CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

Provide concrete masonry unit work, complete as indicated, specified and required.

- A. Work Included in This Section. Principal items are:
1. Concrete block masonry.
 2. Installing reinforcing steel in masonry.
 3. Grout and mortar for masonry.
 4. Shoring, bracing and scaffolding incidental to work of this Section.
 5. Smooth surface parget coat of cement mortar on surfaces of masonry knockout (filler) panels.
 6. Setting and incorporating into masonry all bolts, anchors, inserts, and ledgers.
 7. Building in of frames, vents, pipes, conduits, and inserts.
 8. Pointing, cleaning and protection.
 9. Treatment of masonry surfaces.
- B. Related Work Not Included in This Section.
1. Concrete footings with dowels for masonry.
 2. Furnishing and delivery of steel bar reinforcing.
 3. Furnishing items for embedment with setting instructions and layout drawings.
- C. Waterproofing and/or Water Repellent of Masonry. Masonry surfaces shall be clean and dry before applying surface treatment and shall be free of any efflorescence. Masonry surfaces shall cure for a minimum of 10 days prior to surface treatment application.

Concrete Masonry Units
Section 04220 – 2

1.02 QUALITY ASSURANCE

Unless otherwise specified, all work specified herein and as shown on the drawings shall conform to the applicable requirements of the Uniform Building Code. Arrange for furnishing test specimens as may be required.

- A. Inspection. All masonry work shall be performed under the continuous inspection of the District's Inspector or qualified masonry inspector as selected and approved by District. Costs of retests and/or reinspection because of nonconforming materials or workmanship shall be borne by the Contractor.

1.03 SUBMITTALS

- A. Stock Samples. Submit photos of each type of exposed block. Include in each set, the full range of exposed texture to be expected in the completed work. District's review will be for texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.
- B. Erection of Bond Beams. Prior to delivery of any items of the work specified herein, the Contractor shall submit to the District's representative for approval, shop drawings showing his proposed method of erecting the bond beams at the heads of all openings, including crimped metal or wire inserts in the masonry soaps (half-width blocks), scaffolding, mortar joints, bar reinforcement, grouting, and joint finish.
- C. Compressive Tests. The Contractor shall have compressive tests made of grout to be used in the work and shall submit certificates from a recognized, independent testing laboratory showing that the masonry units, mortar, and grout meet the minimum compressive strengths specified.
- D. Sample Panel. Sample masonry panels shall not be required unless required by the contract plans or the Special Conditions.

1.04 PROTECTION

Provide and be responsible for protection and repair of adjacent surfaces and areas which may be damaged as a result of work of this Section. Protect work performed hereunder until completion and final acceptance of project by District. Repair or replace all damaged or defective work to original specified condition, at no additional cost to the District.

1.05 COORDINATION

Coordinate and cooperate with other trades whose items require embedment into masonry to avoid cutting and patching. Accurately install items in masonry as work progresses and in accordance with approved shop/layout or erection drawings. Cooperate with all other trades in the layout of work.

1.06 SCAFFOLDING

Provide safe and adequate scaffolding, planking, ladders and/or ramps conforming with all applicable CAL/OSHA State of California Construction Safety Orders, and requirements of other governing authorities.

1.07 DELIVERY AND STORAGE

- A. Masonry Units. Masonry units shall be carefully stacked prior to use and shall be properly protected from weather by cover or inside storage. All units shall be handled with reasonable care to prevent marring or damaging of faces, edges and corners of units.
- B. Lime and Cement. Deliver in original packages and store on platforms above ground, protected against moisture.
- C. Aggregates. Store on platforms so as to exclude dirt.
- D. Reinforcing Steel. Store above ground to prevent bending or rusting.
- E. Materials for Treatment of Masonry Surfaces. The contractor shall deliver sealers, coatings, waterproofing, or other surface treatment materials to the site in their original, unopened containers with the manufacturer's labels intact, describing contents and manufacturer.

Stored materials shall be kept covered and precautions shall be taken for the prevention of fire. Empty containers and soiled or oily rags shall be removed from the site at the end of each day's work

PART 2 - PRODUCTS

2.01 MATERIALS

Materials shall conform to the following requirements.

- A. Masonry Units. Grade N-1, natural color, hollow load bearing units conforming to ASTM C-90. Provide in nominal concrete block sizes designated on Drawings with units of standard manufacture as approved by the District, having uniform smooth surfaces. Other block types, where required, shall be of sizes and textures, or combinations of block texturing, as called for on the Drawings.
 - 1. All units shall conform to the requirements of the Quality Control Standards of the Concrete Masonry Association.

Concrete Masonry Units
Section 04220 – 4

2. Masonry units shall have cured for not less than 28 days when placed in the structure.
 3. All masonry units shall have a maximum linear shrinkage of 0.06 of one percent (1%) from the saturated to the oven-dry condition, when tested in accordance with the methods set forth in the Quality Control Standards of the Concrete Masonry Association.
 4. Crimped metal or wire inserts shall be provided in soaps (half-width blocks) at wall opening heads to provide mechanical attachment of the soaps to the bond beam.
- B. Cement. Portland Cement conforming to ASTM C-150, Type I or Type II, low alkali. Use NO plastic cement.
- C. Lime Putty. Made from quick lime conforming to ASTM C-5, and completely slaked before using.
- D. Hydrated Lime. Conforming to ASTM C-207, Type S.
- E. Aggregates. Aggregates for mortar and grout shall be clean, sharp, and well graded, and free from injurious amounts of dust, lumps, shale, alkali, surface coatings and organic matter.
1. For mortar, aggregates shall conform to ASTM C-144, except not less than five percent (5%) shall pass No. 100 sieve.
 2. For grout, aggregates shall conform to ASTM C-404.
 3. For pea gravel, aggregates shall conform with ASTM C-33 graded with not more than five percent (5%) passing a No. 8 sieve and one hundred percent (100%) passing a 3/4 inch sieve.
- F. Shrinkage Reducing Admixture. In all grout for reinforced masonry work, use Sika Chemical Company's "Suconem GA Grout Aid", Type II, "Red Label", or approved equal meeting ASTM requirements for grout for reinforced masonry.
- G. Water. Clean and from potable source.
- H. Tie-Wire. For installation of reinforcing bars, use wire conforming to ASTM A-82, double annealed wire gage No. 18 or heavier.

- I. Mastic Sealant Around Pipes. Where called for on the plans, mastic sealant around pipes through masonry walls, shall consist of a blend of refined asphalts, resins and plasticizing compounds, reinforced with long-fiber asbestos. Primer shall consist of Gilsonite and petroleum asphalts and resinous plasticizers and shall be supplied by manufacturer of mastic sealant.

The mastic shall not lose more than one percent (1%) of its original weight when a 1/4-inch thick sample is maintained at a temperature of 200 degrees Fahrenheit for 4 hours. It shall not become fluid at temperatures of less than 300 degrees Fahrenheit or brittle at temperatures above minus 10 degrees Fahrenheit. The mastic shall not sag in a vertical concrete joint 1/2-inch wide, 1-inch deep, and at least 6-inches long at a temperature of 180 degrees Fahrenheit for a 24-hour period. It shall not rupture or lose bond when it is installed between concrete blocks and, at a temperature of 50 degrees Fahrenheit, is extended to one hundred and fifty percent (150%) of its original length at a rate up to 0.15 inch per hour. Mastic sealant shall be compatible with fillers and shall be pressure grade, unless otherwise approved by the Engineer.

- J. Waterproofing. Below grade surfaces shall be waterproofed with a pre-fabricated self-adhering sheet type waterproofing membrane. The membrane shall consist of a multi-layer high-strength polymer film that is coated with a rubberized asphalt adhesive. The system shall be MFW SubSeal 40 by Chargar Corporation; or equal.
- K. Water Repellent. Above grade surfaces shall have a water repellent that is a silane/siloxane, volatile organic compound compliant, and free of silicone oils or paraffin wax. The spray equipment shall be high-volume, low-pressure, airless with a maximum of 60 psi. The pump shall be non-atomizing and able to flow at a rate of 1 to 1-1/2 gallons per minute. The system shall be Rainguard, Blok-Lok; Prosoco Inc.; or equal.

2.02 MORTAR AND GROUT

- A. Mortar Mix. Type S per U.B.C. Table 21-A.

Mortar shall be freshly prepared and uniformly mixed in the ratio by volumes of one part cement, one-quarter part lime putty or hydrated lime, three and three-fourth parts sand and shall conform to ASTM C-270. Add one pint of admixture per sack of cement. The color of the mortar shall match the color of the concrete masonry units. Mortar coloring pigments shall be pure, non-fading oxides. Mortar shall attain a minimum compressive strength of 1800 psi at 28 days.

- B. Grout Mix. Per U.B.C. Section 2103.4, and the addition of specified shrinkage-reducing admixture in strict conformance with printed recommendations of the manufacturer, as approved by the District.

Grout shall be of fluid consistency and mixed in the ratio by volumes, one part cement, three parts sand, two parts pea gravel. Add one pint of admixture per sack of cement. Grout shall attain a minimum compressive strength of 2000 psi at 28 days.

- C. Mixing. Water (eighty percent (80%) of total), sand and lime shall be placed in the mixer in that order, and mixed for at least one minute, after which the cement and remaining water shall be added and mixed as long as necessary for a uniform mass, but not less than 10 minutes.
- D. Water. Sufficient water shall be used with the grout mix to cause it to flow into all joints without separation of ingredients. Slump of the grout mix shall be approximately 9 - 10 inches depending on temperature and humidity conditions. Only paddle type mixers of at least one sack capacity shall be used. Mortar and grout awaiting the mason's use shall be turned and remixed as required to maintain a workable mix.
1. Grout for pumping shall be as fluid as possible without segregation of the constituent parts, and shall have not less than seven (7) sacks of cement in each cubic yard of grout. Mix shall be approved in advance by the District.
 2. Grout shall not be handled or pumped utilizing aluminum equipment.
- E. Retempering. Retempering of grout will not be permitted. Retempering of mortar shall be done only by adding water into a basin made with the mortar and the mortar carefully worked into the water. Retempering by dashing water over the mortar will not be permitted. Any mortar, or grout, which is unused within one hour after the initial mixing, shall be removed from the work. Mortar shall be mixed and maintained on the boards to a slump of 3/4 inch, plus or minus 1/4 inch, using a truncated cone 4 inches to 2 inches, 6 inches high.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

Masonry Installer must examine the areas and conditions under which masonry work is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work in an effected area until satisfactory conditions have been corrected in a manner acceptable to the Masonry Installer.

3.02 PLACING REINFORCING

- A. General. Clean free of loose rust, scale, and other materials which will reduce bond to mortar or grout. Do not use reinforcing bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross section due to excessive rusting or other causes.
- B. Positioning. Position reinforcing accurately at the spacing shown. Support and secure vertical bars against displacement. Horizontal reinforcing may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1 inch, whichever is greater.
- C. Splicing. Splice reinforcing bars where shown; do not splice at other points unless acceptable to the Engineer. Provide lapped splices unless otherwise shown. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
 - 1. Provide not less than minimum lap shown, or if not shown, lap a minimum of 50 bar diameters. Separate by one bar diameter or wire bars together.
 - 2. Hold vertical bars in position at top and bottom and at intermediate intervals not exceeding 192 diameters of the reinforcement.
- D. Foundation Dowels.
 - 1. Simple Footing. When a foundation dowel does not line up with the vertical core to be reinforced, it shall not be bent over but shall be grouted into a core in direct vertical alignment, even though it is in a cell adjacent to the vertical wall reinforcing.
 - 2. Column Footing. When a foundation dowel does not line up with the vertical core to be reinforced, it may extend into a core in direct vertical alignment or it may be cut off flush with the footing; and the specified bar shall be dowelled into the footing and anchored in place in accordance with the requirements for dowels of Section 03200.

3.03 INSTALLATION, GENERAL

- A. General. Clean top surface of concrete foundation of dirt, projections, and laitance before starting masonry construction. Blocks shall be dry when laid. Clean masonry units of all dust and dirt before laying. Discard cracked and chipped blocks. Erect work plumb, level, and true to line with all corners and angles square.

Concrete Masonry Units
Section 04220 – 8

- B. Layout. Lay out walls in advance for accurate spacing of exposed bond patterns with uniform joint widths, and to properly locate openings, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.
- C. Lay-up. Lay-up walls plumb and true with courses level, accurately spaced and coordinated with other work. Units shall be cut accurately to fit all penetrations, and all holes shall be neatly patched. Where cutting is necessary, all cuts shall be neat and true.
- D. Joints. The starting joint on foundations shall be laid with full mortar coverage on the bed joint, except that the area where grout occurs shall be free of mortar so that grout will contact the foundation. Joints shall be straight, clean, and uniform in thickness. Unless otherwise specified or detailed on the plans, the horizontal and vertical mortar joints shall be 3/8 inch thick with full mortar coverage on cells to be filled. Block joints exposed to view in completed structure shall be tooled with a round bar to produce a dense, slightly concave surface well bonded to the block edges. Cut joints flush for masonry which will be permanently concealed or covered by other materials. Rake out mortar wherever joints are to receive caulking or sealant. Joints which are not tight at time of tooling, shall be raked out, pointed and then tooled.

Textured block joints shall be raked to uniform depth and tooled with flat pointing tool.

Jointing and tooling shall be done when the mortar is partially set but still sufficiently plastic to bond. Jointing tools to be of high grade tool steel that will not blacken mortar joints when joints are rubbed to produce a dense, hard finish.

Vertical head joints shall be buttered well for a thickness at least equal to the face shell of the unit and shall be shoved tightly so that the mortar bonds well to both units. Joints shall be solidly filled from the face of the block to at least the depth of the face shell.

- E. Bond Pattern. Lay masonry units in one-half ($\frac{1}{2}$) running bond with vertical joints in each course centered on units in courses above and below, unless otherwise shown. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
- F. Care. Extreme care shall be taken to prevent visible grout or mortar stains. Masonry units shall be sound, dry, clean and free of cracks and chips when placed in structure. Wetting the units shall not be permitted, except when hot, dry weather causes the units to be warm to the touch, and then the surface only may be wetted with a light fog spray.

- G. Removal of Units. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove masonry units, clean off mortar, and reset in fresh water.

Masonry units with imperfect jointing, nail holes, chipped edges or corners, or other defects shall be corrected, for approval of the Engineer, or the units shall be replaced.

- H. Clean-outs. Clean-out openings shall be provided at bottoms of cells to be filled at each lift or pour of grout where such lift or grout pour is in excess of four feet in height. Overhanging mortar or other obstructions or debris shall be removed from such cells. The clean-outs shall be sealed before grouting, after inspection.

- I. Stops. Stop masonry work by racking back one-half ($\frac{1}{2}$) masonry unit length in each course; do not tooth. Stop grout pours four (4) inches back of rack ends and as further specified at top of pours. Prior to resuming masonry work, remove loose units and unbounded mortar, clean exposed surfaces of set masonry and, if specified to be wetted, wet units lightly.

J. Mason's Iron Work

1. Contractor shall furnish, set, and build into the masonry, all iron work necessary for the masonry construction, and which is enclosed in the masonry.
2. Contractor shall set and build into the masonry all items which are furnished and located by other trades, or indicated on the Drawings, such as bolts and sleeves for securing the work of such other trades, metal attachments, sleeves, inserts, and similar items. Setting shall consist of the bedding, or setting in mortar or dry pack, of all items to be set.
3. Contractor shall build into the masonry all items furnished, located, and set by others such as door frames, vents, conduit, pipes, and the like. Building into masonry shall consist of filling-in with mortar or grout around all items to be built into masonry, including hollow metal door frames. All such items shall be set and built-in so that there will be no voids anywhere, and so that the items are installed rigid, solid, and held accurately and securely in place.
4. Contractor shall be responsible for the accurate placement of all mason's iron work. Anchors shall be fully and solidly grouted in place. Unless otherwise noted, embedment shall be not less than two-thirds of the wall thickness.

K. Temporary Form work

1. Provide Form work and shores as required for temporary support of reinforced masonry elements. Design, erect, support, brace and maintain Form work. No formwork or temporary supports shall be attached to the masonry except as specifically permitted by the District.
2. Construct formwork to conform to shape, line and dimensions shown. Make sufficiently tight to prevent leakage of mortar, grout, or concrete (if any). Brace, tie and support, as required, to maintain position and shape during construction and curing of reinforced masonry.
3. Do not remove forms and shores until reinforced masonry member has hardened sufficiently to carry its own weight and all other reasonable temporary loads that may be placed on it during construction.

3.04 INSTALLATION OF REINFORCED CONCRETE MASONRY UNIT (CMU)

A. General. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed crosswebs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8 inch joints.

B. Walls

1. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimensions shown and to provide minimum clearance and grout coverage for vertical reinforcing bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
2. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcing bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

C. Grouting

1. Place vertical reinforcing prior to laying of concrete block. Extend above elevation of maximum pour height as required to allow for splicing.

2. Lay block to maximum pour height. Do not exceed 4 foot height or if bond beam occurs below 4 foot height, stop pour at course below bond beam. High lift grouting may be used at Contractor's option, as approved and in accordance with Code.
3. Reinforcing steel shall be secured in place and inspected before grouting starts. Mortar dropping should be kept out of the grout space. All vertical cells shall have vertical alignment to maintain a continuous unobstructed cell area not less than 2 inches by 3 inches. All cells shall be solidly filled with grout.
4. Pour grout using container with spout or by chute. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 1½ inches below top course of pour.
5. Bond Beams. Stop grout in vertical cells 1½ inches below bond beam course. Place horizontal reinforcing in bond beam; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

D. Cleaning and Protection

1. Protect all adjoining work from mortar and grout.
2. Concrete scum, mortar and grout stains on the wall shall be removed immediately, and stains on surfaces to remain exposed shall be sandblasted from corner to corner of wall surface to obtain clean uniform appearance, at no additional cost to the District.
3. After the wall is constructed, it should not be saturated with water for curing or any other purposes.
4. In areas where the atmosphere is dry, the masonry wall shall have its surface dampened with a very light fog spray during a curing period for the mortar of three (3) days.

E. Parge coating of masonry knockout (filler) panels shall be cement mortar applied with a smooth surface.

Concrete Masonry Units
Section 04220 – 12

3.05 CLEAN-UP AND REWORK

At the conclusion of the masonry work, the masonry contractor shall clean all masonry as required in these specifications, remove scaffolding and equipment used in the work, and remove all debris, refuse, and surplus masonry material, and remove them from the premises.

END OF SECTION 04220