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SECTION 042000 - UNIT MASONRY

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. M.S.U. ISSUES

Brick selected should be compatible with surrounding buildings and contribute to a unified expression for the M.S.U. Campus. The brick selected must be approved by M.S.U. Brick Committee before inclusion in the specifications.

Normally the designer will select three or more brick acceptable for the project and include these in the specification. An allowance method is not acceptable. The statement “Match Existing Brick” in the specification is not acceptable.

* + - 1. SUMMARY
				1. This Section includes unit masonry assemblies consisting of the following:

Adjust list below to suit Project.

Concrete masonry units (CMUs).

Face brick.

* + - * 1. See Division 5 Section METAL FABRICATIONS for furnishing steel lintels for unit masonry.
				2. See Division 7 Section SHEET METAL FLASHINGS AND TRIM for furnishing manufactured reglets installed in masonry joints for metal flashing.
				3. See Division 7 Section BUILDING INSULATION for cavity insulation.
			1. SUBMITTALS
				1. Product Data: For each type of product indicated.

Delete first paragraph below if reinforcing bars are not used.

* + - * 1. Samples for each type and color of exposed masonry units.

Usually retain paragraph and subparagraph below. See Editing Instruction No. 3 in the Evaluations for information on material certificates.

* + - * 1. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

Retain subparagraph below if required by authorities having jurisdiction or if desired.

For masonry units include material test reports substantiating compliance with requirements.

Requirements in paragraph below are from the 2002 MSJC Specification.

* + - * 1. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
			1. QUALITY ASSURANCE

See Editing Instruction No. 3 in the Evaluations for information on preconstruction testing.

* + - * 1. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.

Build sample panels for each type of exposed unit masonry construction in sizes approximately 60 inches long by 48 inches high.

* + - 1. PROJECT CONDITIONS
				1. 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. PRODUCTS
	* + 1. CONCRETE MASONRY UNITS (CMUs)
				1. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

Retain first paragraph and subparagraphs below for increased water resistance of units if required. If retaining, also retain water-repellent mortar admixture.

* + - * 1. Concrete Masonry Units: ASTM C 90 Grade N

See Editing Instruction No. 2 in the Evaluations before selecting unit compressive strength in subparagraph below.

Insert other forms of block, e.g., sound absorbing, preinsulated, etc., where required.

* + - * 1. Concrete Building Brick: ASTM C 55 Grade N

See Editing Instruction No. 2 in the Evaluations before selecting unit compressive strength in subparagraph below.

* + - 1. BRICK
				1. General:

For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

On Drawings, show details of special conditions and special shapes required.

Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

Select one of two grades in paragraph below, usually the first, and one of three types to match brick selected. See Editing Instructions No. 5 and No. 6 in the Evaluations.

* + - * 1. Face Brick: ASTM C 216, Grade SW, Type  FBS.

See Editing Instruction No. 2 in the Evaluations before selecting unit compressive strength in subparagraph below. Below is based on net area, as in Table 1 in the 2002 MSJC Specification, rather than gross area reported by ASTM C 67.

Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 8000 psi .

Consider retaining first subparagraph below; it eliminates the need to wet brick before laying. Before retaining, verify that brick selected complies with requirements. See Evaluations.

Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.

Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

Delete subparagraph below if surface-coated brick is not used.

Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet.

Sizes in remaining subparagraphs are examples only. Verify availability of sizes with local suppliers and revise to suit Project.

Select from 2 subparagraphs below for 3 courses in 8 inches (203 mm).

Select one of three grades in paragraph below, usually the first unless brick is not exposed to weather. See Editing Instruction No. 5 in the Evaluations.

Hollow brick is not simply face brick with the usual cores (holes); it is brick that has voids (cores and cells) exceeding 25 percent of gross cross-sectional area. See Evaluations. If retaining paragraph below, select one grade, class, and type. See Editing Instructions No. 5 and No. 6 in the Evaluations.

Sizes in two subparagraphs below are examples only. Verify availability of sizes with local suppliers and revise to suit Project.

* + - 1. MORTAR AND GROUT MATERIALS

Coordinate requirements in this Article with those in "Mortar and Grout Mixes" Article.

Retain one or more of three paragraphs and associated subparagraphs below. Delete masonry cement if not allowed by "Mortar and Grout Mixes" Article. See Evaluations for discussion of masonry cement.

* + - * 1. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
				2. Hydrated Lime: ASTM C 207, Type S.
				3. Masonry Cement: ASTM C 91.

Coordinate subparagraph and list below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.

* + - * 1. Aggregate for Mortar: ASTM C 144.

Delete subparagraph below if not required.

For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

Retain subparagraph below for colored-aggregate mortar.

* + - * 1. Aggregate for Grout: ASTM C 404.
				2. Water: Potable.
			1. REINFORCEMENT

Delete first paragraph below if no reinforcing bars in grouted cells are required.

* + - * 1. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
				2. Masonry Joint Reinforcement: ASTM A 951; mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls.

Wire Size for Side Rods: W1.7 or 0.148-inch diameter.

Select one wire size from options in subparagraph above and below.

Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.

Retain first subparagraph below and select one wire size if adjustable (two-piece) type reinforcement is required.

Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.

Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.

Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

Multiwythe Masonry:

Select acceptable types from first three subparagraphs below. More than one type may be needed; Part 3 "Composite Masonry" and "Cavity Walls" articles specify types required for various applications.

Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.

Tab type, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

Retain option in first subparagraph below in Seismic Design Categories E and F (UBC Seismic Zones 3 and 4) and in other locations if continuous horizontal wire is used to reinforce veneer wythe.

Adjustable (two-piece) type, with one side rod at each face shell of backing wythe and with ties that extend into facing wythe. Ties engage eyes or slots in reinforcement and extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

* + - 1. TIES AND ANCHORS
				1. Materials:

Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.

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.

Retain subparagraph below if required for rigid anchors.

Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

* + - * 1. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
				2. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.

Retain first paragraph and subparagraphs below if applicable to Project. Indicate details on Drawings.

* + - * 1. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.

Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- diameter, hot-dip galvanized steel wire.

Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.053-inch- thick, steel sheet, galvanized after fabrication.

* + - * 1. Partition Top anchors: 0.097-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

Rigid anchors can be used to connect T-intersections of CMU shear walls in lieu of masonry bonding or bond beams. They are also often used at T-intersections of other CMU walls, although masonry bonding and T-shaped masonry joint reinforcement may be used. Delete first paragraph and subparagraph below if not required.

* + - * 1. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.

Select one of two options in subparagraph below. Rigid anchors may not be fully embedded in mortar or grout and, therefore, require a coating for corrosion protection.

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

Coordinate subparagraph and list below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.

* + - 1. EMBEDDED FLASHING MATERIALS

See Evaluations for discussion of flashing materials before editing this Article.

Coordinate paragraph and subparagraphs below with Division 7 Section "Sheet Metal Flashing and Trim." Metal through-wall flashing is included in that Section.

* + - * 1. Metal Flashing: Provide metal flashing complying with Division 7 Section SHEET METAL FLASHING AND TRIM.

Delete first paragraph and subparagraphs below if only metal flashing is allowed. If concealed metal flashing is required at certain locations, indicate those locations on Drawings or revise below.

* + - * 1. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section SHEET METAL FLASHING AND TRIM.
				2. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer.

Products described in paragraph and subparagraphs below can be used to keep weep holes clear and to keep cavity free draining. See Evaluations.

* + - 1. MORTAR AND GROUT MIXES
				1. General: Do not use admixtures, unless otherwise indicated.

Do not use calcium chloride in mortar or grout.

Delete subparagraph below if masonry cement is acceptable for exterior and reinforced masonry.

Limit cementitious materials in mortar for exterior masonry to portland cement and lime.

Delete subparagraph below if not retaining cold-weather admixture.

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.

Retain and edit one of two paragraphs below. See Evaluations.

* + - * 1. Mortar for Unit Masonry: Comply with ASTM C 270 Property Specification.

For each masonry condition in five subparagraphs below applicable to Project, select one mortar type or revise to suit Project. See Editing Instruction No. 7 in the Evaluations before making selections.

For masonry below grade or in contact with earth, use Type M.

Delete first subparagraph below if no masonry is grouted and reinforced with steel reinforcing bars.

For reinforced masonry, use Type S.

For mortar parge coats, use Type S or N.

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.

Delete subparagraph below if not allowed.

For interior non-load-bearing partitions, Type O may be used instead of Type N.

Delete first paragraph and subparagraphs below if pigmented mortar is not required.

* + - * 1. Grout for Unit Masonry: Comply with ASTM C 476.
1. EXECUTION
	* + 1. INSTALLATION, GENERAL
				1. 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.
				2. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
				3. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

See Evaluations for discussion of tolerances.

* + - * 1. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

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, 1/4 inch in 20 feet, or 1/2 inch maximum.

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, 1/4 inch in 20 feet, or 1/2 inch maximum.

* + - 1. LAYING MASONRY WALLS
				1. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

Pattern is usually running bond. If other bond patterns are required, revise first paragraph below or indicate on Drawings.

* + - * 1. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
				2. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

Revise first paragraph below if flexible perimeter joint or thermal break is required.

* + - * 1. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
				2. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
			1. MORTAR BEDDING AND JOINTING

Delete first paragraph and subparagraphs below if no hollow concrete masonry units are required. Mortar bedding of cross webs should be added if required.

* + - * 1. Lay hollow brick and concrete masonry units as follows:

With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

With webs fully bedded in mortar in all courses of piers, columns, and pilasters.

With webs fully bedded in mortar in grouted masonry, including starting course on footings.

With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

* + - * 1. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

Delete paragraph and subparagraphs below if structural-clay tile is not used.

If another joint profile is used, revise first paragraph below or show on Drawings.

* + - * 1. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
				2. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.
			1. CAVITY WALLS

Delete this Article if cavity walls are not used.

* + - * 1. Bond wythes of cavity walls together using one of the following methods:

Retain one or more of three subparagraphs below; edit methods retained to suit Project and office practice.

Revise spacings in subparagraph below to suit coursing, to comply with requirements of authorities having jurisdiction, or to comply with structural requirements imposed by wind or seismic forces. Spacings are for wire ties 0.188 inch (4.8 mm) in diameter and wire ties 0.148 inch (3.8 mm) in diameter, respectively.

Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

Attempting to remove mortar fins from cavity or to trowel them flat against brick usually results in increased mortar droppings at base of cavity.

* + - * 1. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

Delete paragraph below if cavities are not insulated; revise if adhesive is not used.

* + - * 1. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit insulation between wall ties and other confining obstructions, with edges butted tightly. Press units firmly against inside wythe of masonry.
			1. MASONRY JOINT REINFORCEMENT
				1. General: Install in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
				2. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

First paragraph below can be deleted if rigid anchors are used to bond walls at intersections.

* + - * 1. Provide continuity at wall intersections by using prefabricated T-shaped units.
				2. Provide continuity at corners by using prefabricated L-shaped units.
			1. FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

Retain option in first paragraph below if wall is designed on rain-screen principle with vents acting to equalize air-pressure differential between cavity and exterior. Indicate spacing of vents and blocking on Drawings. See Evaluations.

* + - * 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. Install flashing as follows, unless otherwise indicated:

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.

At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.

Delete subparagraph above or below or both.

Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

* + - * 1. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

Delete paragraph below if cavity walls are not used. Retain applicable products in Part 2 if retaining below.

* + - * 1. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

Retain paragraph and subparagraph below if wall is designed on rain-screen principle with vents acting to equalize air-pressure differential between cavity and exterior. Indicate spacing of vents and blocking on Drawings. See Evaluations.

See Editing Instruction No. 3 in the Evaluations before editing this Article.

Consider inserting a subparagraph listing inspections that will be performed. Delete subparagraph below if not required.

Testing frequency in first paragraph below is from the 2002 MSJC Code and the 1997 Uniform Building Code.

If retaining paragraph below, select either or both tests listed; insert others if required. Testing for mortar air content is especially desirable for reinforced masonry. Testing for compressive strength is desirable if the property specification for mortar is used.

Paragraph above may be deleted if mortar is specified to comply with proportion specification; paragraph below may be deleted if grout is specified by proportions stated in ASTM C 476 or UBC Standard 21**-**19 rather than by compressive strength.

* + - 1. PARGING
				1. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch with a steel-trowel finish. Form a wash at top of parging and a cove at bottom. Damp-cure parging for at least 24 hours and protect parging until cured.
			2. CLEANING
				1. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
				2. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.

Protect adjacent surfaces from contact with cleaner.

Delete subparagraph above and first subparagraph below if cleaners are not specified in Part 2 or if cleaners are not allowed.

Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

Retain subparagraph above or first subparagraph below. Coordinate with products retained in Part 2. If high-pressure water cleaning or other methods are acceptable, delete or revise below and insert applicable requirements.

Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

Clean concrete masonry by cleaning method indicated in NCMA TEK 8**-**2A applicable to type of stain on exposed surfaces.

* + - 1. MASONRY WASTE DISPOSAL

Retain paragraph and subparagraphs below if clean masonry waste can be used as fill in footing trenches, etc. This diverts some material from waste stream, conserving landfill space and energy required to haul waste away.

* + - * 1. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

Do not dispose of masonry waste as fill within 18 inches of finished grade.

Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off owner's property.

END OF SECTION 042000