

SECTION 04200

MASONRY

1/01

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI SP-66	(1994) ACI Detailing Manual
ACI 318/318R	(1992) Building Code Requirements for Reinforced Concrete
ACI 318M/318RM	(1992) Building Code Requirements for Reinforced Concrete (Metric)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82	(1997a) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 153/A 153M	(1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 615/A 615M	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 55	(1997a) Concrete Brick
ASTM C 62	(1997a) Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C 67	(1998a) Sampling and Testing Brick and Structural Clay Tile
ASTM C 90	(1998) Loadbearing Concrete Masonry Units
ASTM C 91	(1998) Masonry Cement
ASTM C 126	(1996) Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
ASTM C 129	(1997) Nonloadbearing Concrete Masonry Units
ASTM C 140	(1998b) Sampling and Testing Concrete Masonry Units

ASTM C 143	(1990A) Slump of Hydraulic Cement Concrete
ASTM C 216	(1998) Facing Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C 236	(1989; R 1993e1) Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box
ASTM C 270	(1997ae1) Mortar for Unit Masonry
ASTM C 476	(1998) Grout for Masonry
ASTM C 494	(1998) Chemical Admixtures for Concrete
ASTM C 578	(1995) Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 641	(1982; R 1991) Staining Materials in Lightweight Concrete Aggregates
ASTM C 652	(1997) Hollow Brick (Hollow Masonry Units Made From Clay or Shale)
ASTM C 744	(1998) Prefaced Concrete and Calcium Silicate Masonry Units
ASTM C 780	(1996) Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C 1019	(1989a; R 1998) Sampling and Testing Grout
ASTM C 1072	(1998) Measurement of Masonry Flexural Bond Strength
ASTM C 1289	(1998) Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM D 2000	(1998c) Rubber Products in Automotive Applications
ASTM D 2240	(1997e1) Rubber Property - Durometer Hardness
ASTM D 2287	(1996) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM E 90	(1999) Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E 119	(1998) Fire Tests of Building Construction and Materials
ASTM E 447	(1992b) Compressive Strength of Masonry Prisms

ASTM E 514

(1990; R 1996e1) Standard Test Method for
Water Penetration and Leakage Through Masonry

PENTSTAR TRAINING MANUAL

1.2 SYSTEM DESCRIPTION

1.2.1 Performance Requirements for Concrete Form Masonry Unit System

1.2.1.1 Sound Transmission Coefficient

STC 61 minimum when tested in accordance with ASTM E 90.

1.2.1.2 Water Penetration

No water penetration to interior surface when tested in accordance with ASTM E 514.

1.2.2 Contractors Option to Concrete Form Masonry Unit System

Contractor has the option to substitute a concrete masonry unit (CMU) cavity wall system for the specified concrete Form Masonry Unit (CFMU) system. CMU cavity wall systems shall include solid 100 mm (4 inches) CMU face wythe, 20 mm (3/4 inch) air space, rigid board-type insulation of sufficient thickness to comply with specified thermal performance and adhered to inner wythe, and a parged [200 mm (8 inches)] [250 mm (10 inches)] thick solidly grouted CMU inner wythe reinforced to provide structural capacity equivalent to that shown on drawings.

1.2.2.1 Modifications to Width of Walls

Use of CMU cavity wall system may require thicker walls than shown on Drawings. Contractor shall submit shop drawings as specified in SUBMITTALS Paragraph showing modifications to dimensions of buildings and coordination with other work required as a consequence of Contractors acceptance of this option. Interior dimensions of building shall be maintained to extent practical and except where expanding building perimeter would interfere with critical clearances and required functionalities.

1.2.3 Submittals

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Masonry Work; G, [_____]

Drawings including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; offsets; tops, bottoms, and ends of walls; control and expansion joints; and wall openings. Bar splice locations shall be shown. Drawings shall be provided showing the location and layout of glass block units. If the Contractor opts to furnish inch-pound CMU products, drawings showing elevation of walls exposed to view and indicating the location of all cut CMU products shall be submitted for approval. If the Contractor opts to furnish CMU cavity wall instead of CFMU wall, drawings showing required modifications to floor plans and wall details shall be submitted for approval. Bent bars shall be identified on a bending diagram and shall be referenced and located on the drawings. Wall dimensions, bar clearances, and wall openings greater than one masonry unit in area shall be shown. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, the approved shop drawings shall be resubmitted with the additional

openings shown along with the proposed changes. Location of these additional openings shall be clearly highlighted. The minimum scale for wall elevations shall be 1 to 50. (1/4 inch per foot.) Reinforcement bending details shall conform to the requirements of ACI SP-66.

SD-03 Product Data

Clay or Shale Brick; G, [_____] Concrete Brick; G, [_____] Prefaced Concrete Masonry Units; G, [_____] Glass Block Units and Accessories; G, [_____] Insulation; G, [_____] Ceramic Glazed Structural Clay Facing Units; G, [_____]

Manufacturers descriptive data.

Cold Weather Installation; G, [_____]

Cold weather construction procedures.

SD-04 Samples

Concrete Masonry Units (CMU); G, [_____] Prefaced Concrete Masonry Units; G, [_____] Concrete Brick; G, [_____] Stone Items; G, [_____] Glass Block Units and Accessories; G, [_____] Clay or Shale Brick; G, [_____] Ceramic Glazed Structural Clay Facing Units; G, [_____]

Color samples of three stretcher units and one unit for each type of special shape. Units shall show the full range of color and texture.

Concrete Form Masonry Units (CFMU); G, [_____]. Provide sample of assembled CFMU.

Color samples of three CFMU face shells for each type of special shape, color, and texture. Units shall show the full range of color and texture.

CFMU insulation shall contain the label indicating the rated permeance and R-values.

Anchors, Ties, and Bar Positioners; G, [_____]

Two of each type used.

Expansion-Joint Materials; G, [_____]

One piece of each type used.

Joint Reinforcement; G, [_____]

One piece of each type used, including corner and wall intersection pieces, showing at least two cross wires.

Board Type Insulation; G, [_____]

One piece of board type insulation, not less than 400 mm (16 inches) by 600 mm (24 inches) in size, containing the label indicating the rated permeance and R-values.

Portable Panel; G, [_____]

One panel of clay or shale brick, 600 mm by 600 mm, (2 feet by 2 feet,) containing approximately 24 brick facings to establish range of color and texture.

SD-06 Test Reports

Efflorescence Test; G, [_____]Field Testing of Mortar; G, [_____]Field Testing of Grout; G, [_____]Prism tests; G, [_____]Masonry Cement; G, [_____]Fire-rated CMU; G, [_____]

Test reports from an approved independent laboratory. Test reports on a previously tested material shall be certified as the same as that proposed for use in this project.

Special Inspection; G, [_____]

Copies of masonry inspector reports.

SD-07 Certificates

Clay or Shale Brick; [_____], [_____]Concrete Brick; [_____], [_____]Concrete Masonry Units (CMU); [_____], [_____]Concrete Form Masonry Units (CFMU); [_____] , [_____]Prefaced Concrete Masonry Units; [_____], [_____]Control Joint Keys; [_____], [_____]Anchors, Ties, and Bar Positioners; [_____], [_____]Expansion-Joint Materials; [_____], [_____]Joint Reinforcement; [_____], [_____]Reinforcing Steel Bars and Rods; [_____], [_____]Masonry Cement; [_____], [_____]Mortar Coloring; [_____], [_____]Insulation; [_____], [_____]Precast Concrete Items; [_____], [_____]Mortar Admixtures; [_____], [_____]Grout Admixtures; [_____], [_____]Glass Block Units and Accessories; [_____], [_____]Ceramic Glazed Structural Clay Facing Units; [_____], [_____]

Certificates of compliance stating that the materials meet the specified requirements.

Insulation; [_____], [_____]

Certificate attesting that the polyurethane or polyisocyanurate insulation furnished for the project, including insulation furnished as part of CFMU, contains recovered material, and showing an estimated percent of such recovered material.

1.2.4 Submittals for Concrete Fill

Submittals for concrete fill shall be in accordance with Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

1.3 SAMPLE MASONRY PANELS

After material samples are approved and prior to starting masonry work, sample masonry panels shall be constructed for each type and color of masonry required. At least 48 hours prior to constructing the sample panel or panels, the Contractor shall submit written notification to the Contracting Officers Representative. Sample panels shall not be built in, or as part of the structure, but shall be located where directed.

1.3.1 Configuration

Panels shall be L-shaped or otherwise configured to represent all of the wall elements. Panels shall be of the size necessary to demonstrate the acceptable level of workmanship for each type of masonry represented on the project. The minimum size of a straight panel or a leg of an L-shaped panel shall be 2.5 m (8 feet long) by [1.2] [1.8] m. ([4] [6] feet high.)

1.3.2 Composition

Panels shall show full color range, texture, and bond pattern of the masonry work. The Contractors method for mortar joint tooling; grouting of CFMU and reinforced vertical cores, collar joints, bond beams, and lintels; positioning, securing, and lapping of reinforcing steel; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work shall be demonstrated during the construction of the panels. Installation or application procedures for anchors, wall ties, glass block units, CMU control joints, brick expansion joints, insulation, flashing, brick soldier, row lock courses and weep holes shall be shown in the sample panels. The panels shall contain [a masonry bonded corner] [a stacked bond corner] that includes a bond beam corner. Panels shall show [parging] [and] [installation of electrical boxes and conduit]. Panels that represent reinforced masonry shall contain a 600 mm by 600 mm (2 foot by 2 foot) opening placed at least 600 mm (2 feet) above the panel base and 600 mm (2 feet) away from all free edges, corners, and control joints. Required reinforcing shall be provided around this opening as well as at wall corners and control joints.

1.3.3 Construction Method

Where anchored veneer walls are required, the Contractor shall demonstrate and receive approval for the method of construction; i.e., either bring up the two wythes together or separately, with the insulation and appropriate ties placed within the specified tolerances across the cavity. Temporary provisions shall be demonstrated to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. Where masonry is to be grouted, the Contractor shall demonstrate and receive approval on the method that will be used to bring up the masonry wythes; support the reinforcing bars; and grout cells, bond beams, lintels, and collar joints using the requirements specified herein. If sealer is specified to be applied to the masonry units, sealer shall be applied to the sample panels. Panels shall be built on a properly designed concrete foundation.

1.3.4 Usage

The completed panels shall be used as the standard of workmanship for the type of masonry represented. Masonry work shall not commence until the sample panel for that type of masonry construction has been completed and approved. Panels shall be protected from the weather and construction

operations until the masonry work has been completed and approved. After completion of the work, the sample panels, including all foundation concrete, shall become the property of the Contractor and shall be removed from the construction site.

1.4 DELIVERY, HANDLING, AND STORAGE

Materials shall be delivered, handled, stored, and protected to avoid chipping, breakage, and contact with soil or contaminating material.

1.4.1 Masonry Units

Concrete masonry units and concrete form masonry units shall be covered or protected from inclement weather and shall conform to the moisture content as specified in ASTM C 90 when delivered to the jobsite. In addition, glass block units and prefaced concrete units shall be stored with their finish surfaces covered. Prefabricated lintels shall be marked on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.4.2 Reinforcement, Anchors, and Ties

Steel reinforcing bars, coated anchors, ties, and joint reinforcement shall be stored above the ground. Steel reinforcing bars and uncoated ties shall be free of loose mill scale and rust.

1.4.3 Cementitious Materials, Sand, and Aggregates

Cementitious and other packaged materials shall be delivered in unopened containers, plainly marked and labeled with manufacturers names and brands. Cementitious material shall be stored in dry, weathertight enclosures or be completely covered. Cement shall be handled in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Sand and aggregates shall be stored in a manner to prevent contamination or segregation.

1.5 SPECIAL INSPECTION

A qualified masonry inspector approved by the Contracting Officer shall perform inspection of the masonry work. Minimum qualifications for the masonry inspector shall be 5 years of reinforced masonry inspection experience or acceptance by a State, municipality, or other governmental body having a program of examining and certifying inspectors for reinforced masonry construction. The masonry inspector shall be present during preparation of masonry prisms, sampling and placing of masonry units, placement of reinforcement (including placement of dowels in footings and foundation walls), inspection of grout space and concrete fill cavity, immediately prior to closing of cleanouts, and during grouting and concrete fill operations. The masonry inspector shall assure Contractor compliance with the drawings and specifications. The masonry inspector shall keep a complete record of all inspections and shall submit daily written reports to the Quality Control Supervisory Representative reporting the quality of masonry construction.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

The source of materials which will affect the appearance of the finished work shall not be changed after the work has started except with Contracting Officers approval. The Contractor has the option to use either hard metric or substitute inch-pound (soft-metric) CMU products. If the Contractor decides to substitute inch-pound CMU products, the following additional requirements shall be met: a. The metric dimensions indicated on the drawings shall not be altered to accommodate inch-pound CMU products either horizontally or vertically. The 100 mm building module shall be maintained, except for the CMU products themselves.

b. Mortar joint widths shall be maintained as specified.

c. Rebars shall not be cut, bent or eliminated to fit into the inch-pound CMU and CFMU products module.

d. Brick and inch-pound CMU and CFMU products shall not be reduced in size by more than one-third (1/3) in height and one-half (1/2) in length. Cut CMU and CFMU products shall not be located at ends of walls, corners, and other openings except as shown on drawings.

e. Cut, exposed brick, and CMU and CFMU products shall be held to a minimum and located where they would have the least impact on the architectural aesthetic goals of the facility.

f. Other building components, built into the CMU and CFMU products, such as window frames, door frames, louvers, grilles, fire dampers, etc., that are required to be metric, shall remain metric.

g. Additional metric guidance shall conform to Section 01415 METRIC MEASUREMENTS.

2.2 CLAY OR SHALE BRICK

Color range and texture of clay or shale brick shall be as indicated and shall conform to the approved sample. Grade SW shall be used for brick in contact with earth or grade and for [the first six exterior courses above grade] [all exterior work]. Grade SW or MW shall be used in other brickwork. Brick shall be tested for efflorescence. Clay or shale brick units shall be delivered factory-blended to provide a uniform appearance and color range in the completed wall.

2.2.1 Solid Clay or Shale Brick

Solid clay or shale brick shall conform to [ASTM C 62] [ASTM C 216, Type [FBS] [FBA] [FBX]]. Brick size shall be modular and the nominal size of the brick used shall be [_____] mm ([_____] inches) thick, [_____] mm ([_____] inches) wide, and [_____] mm ([_____] inches) long. Minimum compressive strength of the brick shall be [_____] MPa ([_____] psi.)

2.2.2 Hollow Clay or Shale Brick

Hollow clay or shale brick shall conform to ASTM C 652, Type [HBS] [HBX] [HBA] [HBB]. Brick size shall be modular and the nominal size of the brick

used shall be [_____] mm ([_____] inches) thick, [_____] mm ([_____] inches) wide, and [_____] mm ([_____] inches) long. Where vertical reinforcement is shown in hollow brick, the minimum cell dimension shall be 64 mm (2-1/2 inches) (2-1/2 inches) and the units shall be designed to provide precise vertical alignment of the cells. Minimum compressive strength of the brick shall be [_____] MPa ([_____] psi). ([_____] psi.)

2.3 CONCRETE BRICK

Concrete brick shall conform to ASTM C 55, Type I, Grade [N-I] [N] [S] [S-II]. Concrete brick may be used where necessary for filling out in concrete masonry unit construction.

2.4 CONCRETE MASONRY UNITS (CMU)

Hollow and solid concrete masonry units shall conform to ASTM C 90, Type I. Cement shall have a low alkali content and be of one brand.

2.4.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with ASTM C 641: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification.

2.4.2 Kinds and Shapes

Units shall be modular in size and shall include closer, jamb, header, lintel, and bond beam units and special shapes and sizes to complete the work as indicated. In exposed interior masonry surfaces, units having a bullnose shall be used for vertical external corners except at door, window, and louver jambs. Radius of the bullnose shall be 25 mm (1 inch). (1 inch.) Units used in exposed masonry surfaces in any one building shall have a uniform fine to medium texture and a uniform color.

2.4.2.1 Architectural Units

Units shall have patterned face shell. Face shell pattern shall be [fluted] [vertical scored] [split ribbed] [_____] . Units shall be integrally colored during manufacture. Color shall be [_____] . Patterned face shell shall be properly aligned in the completed wall.

2.4.2.2 Patterned, Decorative Screen Units

Patterned, decorative screen units shall conform to the applicable requirements of [ASTM C 90] [ASTM C 129]. Units shall have uniform through-the-wall pattern, color, and texture.

2.4.3 Fire-Rated CMU

Concrete masonry units used in fire-rated construction shown on the drawings shall be of minimum equivalent thickness for the fire rating indicated and the corresponding type of aggregates indicated in TABLE I. Units containing more than one of the aggregates listed in TABLE I will be rated on the aggregate requiring the greater minimum equivalent thickness to produce the required fire rating.

TABLE I

FIRE-RATED CONCRETE MASONRY UNITS

See note (a) below
Minimum equivalent thickness in
mm (inches) for fire rating of:

Aggregate Type	4 hours	3 hours	2 hours
Pumice	120 (4.7)	100 (4.0)	75 (3.0)
Expanded slag	130 (5.0)	110 (4.2)	85 (3.3)
Expanded clay, shale, or slate	145 (5.7)	120 (4.8)	95 (3.7)
Limestone, scoria, cinders or unexpanded slag	150 (5.9)	130 (5.0)	100 (4.0)
Calcareous gravel	160 (6.2)	135 (5.3)	105 (4.2)
Siliceous gravel	170 (6.7)	145 (5.7)	115 (4.5)

(a) Minimum equivalent thickness shall equal net volume as determined in conformance with ASTM C 140 divided by the product of the actual length and height of the face shell of the unit in millimeters (inches). Where walls are to receive plaster or be faced with brick, or otherwise form an assembly; the thickness of plaster or brick or other material in the assembly will be included in determining the equivalent thickness.

2.5 PREFACED CONCRETE MASONRY UNITS

Prefaced concrete masonry units shall conform to ASTM C 744 using masonry units conforming to ASTM C 90, Type 1. The facing shall turn over the edges and ends of the unit at least 10 mm (3/8 inch) (3/8 inch) in the direction of the thickness of the unit to form a lip at least 2 mm (1/16 inch) (1/16 inch) thick. Variation in color and texture shall not exceed that of the approved samples. All shapes and sizes shall be provided for a complete installation. Bullnose units shall be used along sills and caps and at vertical external corners including door jambs, window jambs, and other such openings. Radius of the bullnose shall be 25 mm (1 inch). (1 inch.) Base units shall be coved to meet finished floor surfaces where ceramic tile floor occurs.

2.6 CONCRETE FORM MASONRY UNITS (CFMU)

2.6.1 Concrete Form Masonry Units

Concrete Form Masonry Units shall consist of two concrete masonry face shells joined with plastic cross members. The cross members shall be securely dovetailed into the face shells by the manufacturer. Insulated CFMU shall contain an insulation insert securely positioned to create two cavities within a CFMU wall, an air space and a form cavity to be filled with grout. The air space shall be not less than 20 mm (3/4 inches) thick. The form cavity shall comply with ACI 318.

2.6.1.1 Face Shells

Face shells shall conform to ASTM C 90. The thickness of shell shall be 25 mm (1 inch) measured across its narrowest point. Shells shall be formed with integral dovetail slots. Cement shall have a low alkali content and be of one brand.

2.6.1.1.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with ASTM C 641: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification.

2.6.1.2 Plastic Connector

Plastic Connectors shall be formed from recycled plastic. At least one cross member in each CFMU shall be formed with notches to aid in the secure placement of reinforcing bars.

2.6.1.3 Insulation Insert

2.6.1.3.1 Insulation

Inserts shall be extruded polystyrene, expanded polystyrene, or extruded polyisocyanurate conforming to ASTM C 1289, Type I, Class 2, faced with aluminum foil on both sides of the foam. The insert shall have a thickness of 50 mm (2 inches), 37mm (1-1/2" inches) or 31mm (1-1/4 inch) and shall have a height and width sufficient to abut adjacent insulation inserts in an assembled CFMU wall.

2.6.1.3.2 Aged R-Value

The aged R-value shall be determined at 24 degrees C (75 degrees F) in accordance with the referenced specification. The stated R-value of the insulation shall be certified by an independent testing laboratory or certified by an independent Registered Professional Engineer if tests are conducted in the manufacturers laboratory.

2.6.1.3.3 Recovered Material

The polyisocyanurate foam shall have a minimum recovered material content of 11 percent by weight of the core material (but material reused in the manufacturing process cannot be counted toward the percentage of recovered material).

2.6.2 Kinds and Shapes

Units shall be modular in size and shall include special shapes and sizes to complete the work as indicated. In exposed interior masonry surfaces, units having a bullnose shall be used for vertical external corners except at door, window, and louver jambs. Radius of the bullnose shall be 25 mm (1

inch). (1 inch.) Units used in exposed masonry surfaces in any one building shall have a uniform fine to medium texture and a uniform color.

2.6.2.1 Architectural Units

Units shall have patterned face shell. Face shell pattern shall be [fluted] [vertical scored] [split ribbed] [Ground/burnished] or [glazed]. Units shall be integrally colored during manufacture. Color shall be [_____]. Patterned face shell shall be properly aligned in the completed wall.

2.6.2.2 Prefaced Units

Prefaced face shell shall conform to ASTM C 744 using masonry units conforming to ASTM C 90, Type 1. The facing shall turn over the edges and ends of the unit at least 10 mm (3/8 inch) in the direction of the thickness of the unit to form a lip at least 2 mm (1/16 inch) thick. Variation in color and texture shall not exceed that of the approved samples. All shapes and sizes shall be provided for a complete installation. Bullnose units shall be used along sills and caps and at vertical external corners including door jambs, window jambs, and other such openings. Radius of the bullnose shall be 25 mm (1 inch.) Base units shall be coved to meet finished floor surfaces where ceramic tile floor occurs.

2.6.3 Fire-Rated CFMU

Concrete form masonry units which are solid grouted will be considered a 4-hour fire-rated construction provided that the thickness of the grouted cavity plus the face shell or shells in contact with the grout is 150 mm (6 inches) or greater in thickness.

2.7 GLASS BLOCK UNITS AND ACCESSORIES

Glass block units shall be size, type, pattern, and style specified. Units shall be made of clear colorless glass. Pattern shall be clear with [75] [_____] percent light transmission allowance. Ventilators and accessories shall be the products manufactured by or as recommended by the glass block manufacturer.

2.7.1 Exterior Glass Block Units

Units shall be [_____] pattern, [with LX] [without] fibrous glass insert [_____] texture, and shall be [200 mm (7-3/4 inches)] [[_____] mm ([_____] inches)] ([7-3/4] [_____] inches) by [200 mm (7-3/4 inches)] [[_____] mm ([_____] inches)] ([7-3/4] [_____] inches) by [100 mm (3-7/8 inches)] [[_____] mm ([_____] inches)]. ([3-7/8] [_____] inches.) Reflective glass block units shall have a highly reflective oxide surface coating of a [gray] [_____] color.

2.7.2 Interior Glass Block Units

Units shall be [_____] pattern and shall be [200 mm (7-3/4 inches) by 200 mm (7-3/4 inches) by 80 mm (3-1/8 inches)] [[_____] mm ([_____] inches) by [_____] mm ([_____] inches) by 100 mm (3-7/8 inches.)]

2.7.3 Fire Rated Glass Block Units

Walls and partitions indicated on the drawings to be fire rated and containing glass block units shall use approved units that have been fire tested in accordance with ASTM E 119 to the indicated rating.

2.7.4 Solid Glass Block Units

Units shall be 195 mm by 195 mm by 75 mm. (7-5/8 inches by 7-5/8 inches by 3 inches.)

2.7.5 Horizontal Joint Reinforcement

Joint reinforcement shall be factory fabricated from steel wire, and shall conform to ASTM A 82. Wire shall be zinc coated after fabrication by the hot-dip process conforming to ASTM A 153/A 153M, Class B-2. Reinforcement shall consist of two or more parallel longitudinal wires not lighter than 9 gauge weld connected with cross wires not lighter than 14 gauge at not greater than 200 mm (8 inches) on center. At least one longitudinal wire for each face of glass block shall be provided. Out-to-out dimension of the longitudinal wires shall be 40 mm (1-1/2 inches) less than the actual width of the block. Joint reinforcement in flat sections not less than 2.40 m (8 feet) long shall be provided, except that corner reinforcements and other special shapes may be shorter.

2.7.6 Strip Anchor

Perforated steel strip shall be not less than 20 gauge, minimum of 45 mm (1-3/4 inches) wide by 600 mm (24 inches) long and galvanized after fabrication.

2.7.7 Wire-Type Anchor

Steel wire shall be not less than 9 gauge of approved design suitable for use with the panel stiffener provided and galvanized after fabrication.

2.7.8 Expansion Strip

Dense fibrous glass batt or material shall be as recommended by the glass block manufacturer.

2.7.9 Packing (Backer Rods)

Polyethylene foam, neoprene, or filler shall be as recommended by the sealant manufacturer.

2.8 CERAMIC GLAZED STRUCTURAL CLAY FACING UNITS

Ceramic glazed structural clay facing units shall conform to ASTM C 126, Type I, Grade [SS] [S] glaze and color as indicated. In two-faced walls, Type II units may be used for the base course. Variations in color and texture shall not exceed that of the approved samples. All shapes and sizes shall be provided for a complete installation. Bullnose units shall be used along sills and caps and at vertical external corners including door jambs, window jambs, and other such openings. Base units shall be coved to meet finished floor surfaces where ceramic tile floor occurs. Backs of units exposed in unfinished rooms shall be smooth and free from glaze. Backs of units receiving plaster shall be scored, combed, or otherwise roughened.

Surfaces receiving mortar shall be reasonably free from glaze and suitable for receiving mortar.

2.9 PRECAST CONCRETE ITEMS

Trim, lintels, copings, splashblocks and doorsills shall be factory-made units from a plant regularly engaged in producing precast concrete units. Unless otherwise indicated, concrete shall be 28 MPa (4,000 psi) minimum conforming to Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE using 13 mm (1/2 inch) to No. 4 nominal-size coarse aggregate, and minimum reinforcement shall be the reinforcement required for handling of the units. Clearance of 20 mm (3/4 inch) shall be maintained between reinforcement and faces of units. Unless precast-concrete items have been subjected during manufacture to saturated-steam pressure of at least 827 kPa (120 psi) for at least 5 hours, the items, after casting, shall be either damp-cured for 24 hours or steam-cured and shall then be aged under cover for 28 days or longer. Cast-concrete members weighing over 35 kg (80 pounds) shall have built-in loops of galvanized wire or other approved provisions for lifting and anchoring. Units shall have beds and joints at right angles to the face, with sharp true arises and shall be cast with drip grooves on the underside where units overhang walls. Exposed-to-view surfaces shall be free of surface voids, spalls, cracks, and chipped or broken edges. Precast units exposed-to-view shall be of uniform appearance and color. Unless otherwise specified, units shall have a smooth dense finish. Prior to use, each item shall be wetted and inspected for crazing. Items showing evidence of dusting, spalling, crazing, or having surfaces treated with a protective coating will be rejected.

2.9.1 Lintels

Precast lintels, unless otherwise shown, shall be of a thickness equal to the wall and reinforced with two No. 4 bars for the full length. Top of lintels shall be labeled "TOP" or otherwise identified and each lintel shall be clearly marked to show location in the structure.

2.9.2 Sills and Copings

Sills and copings shall be cast with washes. Sills for windows having mullions shall be cast in sections with head joints at mullions and a 6 mm (1/4 inch) allowance for mortar joints. The ends of sills, except a 20 mm (3/4 inch) wide margin at exposed surfaces, shall be roughened for bond. Treads of doorsills shall have rounded nosings.

2.9.3 Splash Blocks

Splash blocks shall be as detailed. Reinforcement shall be the manufacturers standard.

2.10 STONE ITEMS

Stone for trim, sills, lintels, and copings shall be limestone, sandstone, or granite, and shall be cut to the design shown. Sandstone shall be standard grade, buff, gray, or buff brown, with a smooth finish free from clay pits and tool marks. Granite shall be a good commercial grade building granite of medium or moderately coarse grain, and a light or medium gray or light pink color, with a smooth machine finish on washes, 4-cut finish on treads, and 6-cut or equivalent machine finish on other exposed surfaces.

Limestone shall be standard buff limestone with a smooth machine finish free from tool marks. Lintels, except when supported by a steel member, shall be 100 mm (4 inches) (4 inches) or more thick from face to back edge and of the depth required to support the masonry over the opening. Stone shall have beds and joints at right angles to the face, with sharp, true arises. Copings and sills shall be provided with washes, and where overhanging the walls, shall have drips cut on the underside.

2.11 MORTAR

Mortar shall be Type [S] [N] in accordance with the proportion specification of ASTM C 270 except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate; Type N cement-lime mortar proportions shall be 1 part cement, 1 part lime and 6 parts aggregate; when masonry cement ASTM C 91 is used the maximum air content shall be limited to 12 percent and performance equal to cement-lime mortar shall be verified. Verification of masonry cement performance shall be based on ASTM C 780 and ASTM C 1072. Mortar for prefaced concrete masonry unit wainscots shall contain aggregates with 100 percent passing the 2.36 mm (No. 8) sieve and 95 percent passing the 1.18 mm (No. 16) sieve. Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

2.11.1 Mortar Admixtures

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494, Type C.

2.11.2 Coloring

Mortar coloring shall be added to the mortar used for exposed masonry surfaces to produce a uniform color matching [_____]. Mortar coloring shall not exceed 3 percent of the weight of cement for carbon black and ten percent of the weight of cement for all other pigments. Mortar coloring shall be chemically inert, of finely ground limeproof pigment, and furnished in accurately pre-measured and packaged units that can be added to a measured amount of cement.

2.12 GROUT

Grout shall conform to ASTM C 476. Cement used in grout shall have a low alkali content. Grout slump shall be between 200 and 250 mm. (8 and 10 inches.) Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the work unless additional evidence is furnished that the grout meets the specified requirements.

2.12.1 Grout Admixtures

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall

contain less than 0.2 percent chlorides, and shall conform to ASTM C 494, Type C.

2.12.2 Grout Barriers

Grout barriers for vertical cores shall consist of fine mesh wire, fiberglass, or expanded metal.

2.12.3 CONCRETE FILL FOR CFMU WALLS

Concrete shall be as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Compressive strength f'c shall be [20.7] [_____] Mpa [3,000] [_____] psi at 28 days (90 days if pozzolan is used.) The maximum nominal size coarse aggregate shall be 10 mm (3/8 inch) diameter in accordance with ACI 318M/318RM (ACI 318/318R.) The slump shall be not less than 200 mm (8 inches) in accordance with ASTM C 143. In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494, Type C.

2.12.4 Concrete Fill Barriers

Concrete fill barriers for vertical cavities shall consist of approved plastic panels provided by the CFMU manufacturer.

2.13 ANCHORS, TIES, AND BAR POSITIONERS

Anchors and ties shall be fabricated without drips or crimps and shall be zinc-coated in accordance with ASTM A 153/A 153M, Class B-2. Steel wire used for anchors and ties shall be fabricated from steel wire conforming to ASTM A 82. Anchors and ties shall be sized to provide a minimum of 16 mm (5/8 inch) mortar cover from either face.

2.13.1 Wire Mesh Ties

Wire mesh for tying 100 mm (4 inch) thick concrete masonry unit partitions to other intersecting masonry partitions shall be 13 mm (1/2 inch) mesh of minimum 16 gauge steel wire. Minimum lengths shall be not less than 300 mm. (12 inches.)

2.13.2 Wall Ties

Wall ties shall be rectangular-shaped or Z-shaped fabricated of 5 mm (3/16 inch) diameter zinc-coated steel wire. Rectangular wall ties shall be no less than 100 mm (4 inches) wide. Wall ties may also be of a continuous type conforming to paragraph JOINT REINFORCEMENT. Adjustable type wall ties, if approved for use, shall consist of two essentially U-shaped elements fabricated of 5 mm (3/16 inch) diameter zinc-coated steel wire. Adjustable ties shall be of the double pintle to eye type and shall allow a maximum of 13 mm (1/2 inch) eccentricity between each element of the tie. Play between pintle and eye opening shall be not more than 2 mm (1/16 inch.) The pintle and eye elements shall be formed so that both can be in the same plane.

2.13.3 Dovetail Anchors

Dovetail anchors shall be of the flexible wire type, 5 mm (3/16 inch) diameter zinc-coated steel wire, triangular shaped, and attached to a 12 gauge or heavier steel dovetail section. These anchors shall be used for anchorage of veneer wythes or composite-wall facings extending over the face of concrete columns, beams, or walls. Cells within vertical planes of these anchors shall be filled solid with grout for full height of walls or partitions, or solid units may be used. Dovetail slots are specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

2.13.4 Adjustable Anchors

Adjustable anchors shall be 5 mm (3/16 inch) diameter steel wire, triangular-shaped. Anchors attached to steel shall be 8 mm (5/16 inch) diameter steel bars placed to provide 2 mm (1/16 inch) play between flexible anchors and structural steel members. Spacers shall be welded to rods and columns. Equivalent welded-on steel anchor rods or shapes standard with the flexible-anchor manufacturer may be furnished when approved. Welds shall be cleaned and given one coat of zinc-rich touch up paint.

2.13.5 Bar Positioners

Bar positioners, used to prevent displacement of reinforcing bars during the course of construction, shall be factory fabricated from 9 gauge steel wire or equivalent, and coated with a hot-dip galvanized finish. Not more than one wire shall cross the cell.

2.14 JOINT REINFORCEMENT

Joint reinforcement shall be factory fabricated from steel wire conforming to ASTM A 82, welded construction. Tack welding will not be acceptable in reinforcement used for wall ties. Wire shall have zinc coating conforming to ASTM A 153/A 153M, Class B-2. All wires shall be a minimum of [9] [_____] gauge. Reinforcement shall be ladder type design, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units. Joint reinforcement shall be placed a minimum of 16 mm (5/8 inch) cover from either face. The distance between crosswires shall not exceed 400 mm (16 inches.) Joint reinforcement for straight runs shall be furnished in flat sections not less than 3 m (10 feet) long. Joint reinforcement shall be provided with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features.

2.15 REINFORCING STEEL BARS AND RODS

Reinforcing steel bars and rods shall conform to ASTM A 615/A 615M, Grade 60.

2.16 CONTROL JOINT KEYS

Control joint keys shall be a factory fabricated solid section of natural or synthetic rubber (or combination thereof) conforming to ASTM D 2000 or polyvinyl chloride conforming to ASTM D 2287. The material shall be resistant to oils and solvents. The control joint key shall be provided with a solid shear section not less than 16 mm (5/8 inch) thick and 10 mm (3/8 inch) thick flanges, with a tolerance of plus or minus 2 mm (1/16 inch.) The control joint key shall fit neatly, but without forcing, in masonry unit jamb sash grooves. The control joint key shall be flexible at

a temperature of minus 34 degrees C (minus 30 degrees F) after five hours exposure, and shall have a durometer hardness of not less than 70 when tested in accordance with ASTM D 2240.

2.16.1 Control Joint Keys for CFMU Walls

Control joint keys for CFMU walls shall be installed by placing insulation strip in concrete fill cavity to break positive connection of concrete fill. The control joint key shall fit neatly, in the concrete form masonry unit and shall be flexible at temperature of minus 34 degrees C (minus 30 degrees F) after five hours exposure and shall have durometer hardness of not less than 70 when tested in accordance with ASTM D 2240.

2.17 EXPANSION-JOINT MATERIALS

Backer rod and sealant shall be adequate to accommodate joint compression equal to 50 percent of the width of the joint. The backer rod shall be compressible rod stock of polyethylene foam, polyurethane foam, butyl rubber foam, or other flexible, nonabsorptive material as recommended by the sealant manufacturer. Sealant shall conform to Section 07900 JOINT SEALING.

2.18 INSULATION

2.18.1 Rigid Board-Type Insulation (Does not apply to CFMU inserts.)

Rigid board-type insulation shall be extruded polystyrene, polyurethane, or polyisocyanurate. Polystyrene shall conform to ASTM C 578. Polyurethane or polyisocyanurate shall conform to ASTM C 1289, Type I, Class 2, faced with aluminum foil on both sides of the foam. The insulation shall be a standard product and shall be marked with not less than the manufacturers trademark or name, the specification number, the permeance and R-values.

2.18.1.1 Insulation Thickness and Air Space

The cavity space shall allow for a maximum insulation thickness of [50] [_____] mm, ([2] [_____] inches,) and a minimum air space of 20 mm (3/4 inch.)

2.18.1.2 Aged R-Value

The insulation shall provide a minimum aged R-value of [2 (11)] [_____] ([11] [_____]) for the overall thickness. The aged R-value shall be determined at 24 degrees C (75 degrees F) in accordance with the appropriate referenced specification. The stated R-value of the insulation shall be certified by an independent testing laboratory or certified by an independent Registered Professional Engineer if tests are conducted in the manufacturers laboratory.

2.18.1.3 Recovered Material

Insulation shall contain the highest practicable percentage of recovered material derived from solid waste (but material reused in the manufacturing process cannot be counted toward the percentage of recovered material). Where two materials have the same price and performance, the one containing the higher recovered material content shall be provided. The polyurethane or polyisocyanurate foam shall have a minimum recovered material content of 9 percent by weight of the core material.

2.18.2 Insulation Adhesive

Insulation adhesive shall be specifically prepared to adhere the insulation to the masonry and, where applicable, to the thru-wall flashing. The adhesive shall not deleteriously affect the insulation, and shall have a record of satisfactory and proven performance for the conditions under which to be used.

2.19 FLASHING

Flashing shall be as specified in Section 07600 SHEET METALWORK, GENERAL.

2.20 WEEP HOLE VENTILATORS

Weephole ventilators shall be prefabricated aluminum grill type vents designed to prevent insect entry with maximum air entry. Ventilators shall be sized to match modular construction with a standard 10 mm (3/8 inch) mortar joint.

PART 3 EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

3.1.1 Hot Weather Installation

The following precautions shall be taken if masonry is erected when the ambient air temperature is more than 37 degrees C (99 degrees F) in the shade and the relative humidity is less than 50 percent. All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than 1.2 m (4 feet) ahead of masonry; masonry units shall be set within one minute of spreading mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.

3.1.2 Cold Weather Installation

Before erecting masonry when ambient temperature or mean daily air temperature falls below 4 degrees C, (40 degrees F,) a written statement of proposed cold weather construction procedures shall be submitted for approval. The following precautions shall be taken during all cold weather erection.

3.1.2.1 Preparation

Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.

- a. Air Temperature 4 to 0 degrees C. (40 to 32 Degrees F.) Sand or mixing water shall be heated to produce mortar temperatures between 4 degrees C and 49 degrees C. (40 degrees F and 120 degrees F.)
- b. Air Temperature 0 to minus 4 degrees C. (32 to 25 Degrees F.) Sand and mixing water shall be heated to produce mortar temperatures between 4 degrees C and 49 degrees C. (40 degrees F and 120 degrees F.)

F.) Temperature of mortar on boards shall be maintained above freezing.

- c. Air Temperature minus 4 to minus 7 degrees C. (25 to 20 Degrees F.) Sand and mixing water shall be heated to provide mortar temperatures between 4 degrees C and 49 degrees C. (40 degrees F and 120 degrees F.) Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 24 km/hour. (15 mph.)
- d. Air Temperature minus 7 degrees C (20 Degrees F) and below. Sand and mixing water shall be heated to provide mortar temperatures between 4 degrees C and 49 degrees C. (40 degrees F and 120 degrees F.) Enclosure and auxiliary heat shall be provided to maintain air temperature above 0 degrees C. (32 degrees F.) Temperature of units when laid shall not be less than minus 7 degrees C. (20 degrees F.)

3.1.2.2 Completed Masonry and Masonry Not Being Worked On

- a. Mean daily air temperature 4 degrees C to 0 degrees C. (40 degrees F to 32 degrees F.) Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.
- b. Mean daily air temperature 0 degrees C to minus 4 degrees C. (32 degrees F to 25 degrees F.) Masonry shall be completely covered with weather-resistant membrane for 24 hours.
- c. Mean Daily Air Temperature minus 4 degrees C to minus 7 degrees C. (25 Degrees F to 20 Degrees F.) Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.
- d. Mean Daily Temperature minus 7 degrees C (20 Degrees F) and Below. Masonry temperature shall be maintained above 0 degrees C (32 degrees F) for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps, or other approved methods.

3.1.2.3 Glass Block Requirements

Glass block shall not be laid when the air temperature is below 4 degrees C (40 degrees F) on a falling thermometer, or when it appears probable that temperatures below 4 degrees C (40 degrees F) will be encountered before the mortar has set, unless adequate means are provided for protecting the work from freezing. Protection shall consist of heating and maintaining the temperature of the glass block and mortar materials at not less than 4 degrees C (40 degrees F) and not more than 71 degrees C. (160 degrees F.) After erection, an air temperature above 4 degrees C (40 degrees F) on both sides of the glass block shall be maintained for not less than 72 hours. Work will not be permitted with or on frozen materials. Glass block work may be started at 1 degree C (34 degrees F) on a rising thermometer.

3.2 LAYING MASONRY UNITS

CFMU should be installed to manufacturers requirements, refer to Pentstar Training Manual for more details. Masonry units shall be laid in [running]

[stacked] [the indicated] bond pattern. Facing courses shall be level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances shall be plus or minus 13 mm. (1/2 inch.) Each unit shall be adjusted to its final position while mortar is still soft and plastic. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and re-laid with fresh mortar. Air spaces, cavities, chases, expansion joints, and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be selected from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb. Units being laid and surfaces to receive units shall be free of water film and frost. Solid units shall be laid in a nonfurrowed full bed of mortar. Mortar for veneer wythes shall be beveled and sloped toward the center of the wythe from the cavity side. Units shall be shoved into place so that the vertical joints are tight. Vertical joints of brick and the vertical face shells of concrete masonry units, except where indicated at control, expansion, and isolation joints, shall be completely filled with mortar. Mortar will be permitted to protrude up to 13 mm (1/2 inch) into the space or cells to be grouted or filled with concrete, and up to 7 mm (1/4 inch) into air spaces of CFMU. Means shall be provided to prevent mortar from dropping into the space below. In double wythe construction, the inner wythe may be brought up not more than 400 mm (16 inches) ahead of the outer wythe. Collar joints shall be filled with mortar or grout during the laying of the facing wythe, and filling shall not lag the laying of the facing wythe by more than 200 mm. (8 inches.)

3.2.1 Surface Preparation

Surfaces upon which masonry is placed shall be cleaned of laitance, dust, dirt, oil, organic matter, or other foreign materials and shall be slightly roughened to provide a surface texture with a depth of at least 3 mm. (1/8 inch.) Sandblasting shall be used, if necessary, to remove laitance from pores and to expose the aggregate.

3.2.2 Forms and Shores

Forms and shores shall be sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout. Supporting forms and shores shall not be removed in less than 10 days.

3.2.3 Concrete Masonry Units

Units in piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Foundation walls below grade shall be grouted solid. Jamb units shall be of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved. Double walls shall be stiffened at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of the double wall. Walls and partitions shall be adequately reinforced for

support of wall-hung plumbing fixtures when chair carriers are not specified.

3.2.4 Concrete Form Masonry Units

Units shall be full bedded in mortar under both face shells and at head joints of both face shells. Special units shall be of types required and as shown on drawings. Walls shall be stiffened at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of the double wall. Walls and partitions shall be adequately reinforced for support of wall-hung plumbing fixtures when chair carriers are not specified. Lay units so that insulation inserts abut adjacent foam inserts. Promptly remove mortar droppings from top and sides of insulation inserts.

3.2.5 Clay or Shale Brick Units

Brick facing shall be laid with the better face exposed. Brick shall be laid in running bond with each course bonded at corners, unless otherwise indicated. Molded brick shall be laid with the frog side down. Brick that is cored, recessed, or has other deformations may be used in sills, treads, soldier courses, except where deformations will be exposed to view.

3.2.5.1 Wetting of Units

Wetting of clay, shale brick, or hollow brick units having an initial rate of absorption of more than 0.155 gm per minute per square cm (1 gm per minute per square inch) of bed surface shall be in conformance with ASTM C 67. The method of wetting shall ensure that each unit is nearly saturated but surface dry when laid.

3.2.5.2 Solid Units

Bed, head, and collar joints shall be completely filled with mortar.

3.2.5.3 Hollow Units

Hollow units shall be laid as specified for concrete masonry units.

3.2.6 Tolerances

Masonry shall be laid plumb, true to line, with courses level. Bond pattern shall be kept plumb throughout. Corners shall be square unless noted otherwise. Except for walls constructed of prefaced concrete masonry units or prefaced concrete form masonry units, masonry shall be laid within the following tolerances (plus or minus unless otherwise noted):

TABLE II
TOLERANCES

Variation from the plumb in the lines
and surfaces of columns, walls and arises

In adjacent masonry units	3 mm
In 3 m	6 mm
In 6 m	10 mm
In 12 m or more	13 mm

Variations from the plumb for external corners,
expansion joints, and other conspicuous lines

In 6 m	6 mm
In 12 m or more	13 mm

Variations from the level for exposed lintels,
sills, parapets, horizontal grooves, and other
conspicuous lines

In 6 m	6 mm
In 12 m or more	13 mm

Variation from level for bed joints and top
surfaces of bearing walls

In 3 m	6 mm
In 12 m or more	13 mm

Variations from horizontal lines

In 3 m	6 mm
In 6 m	10 mm
In 12 m or more	13 mm

Variations in cross sectional dimensions of
columns and in thickness of walls

Minus	6 mm
Plus	13 mm

(TABLE II

TOLERANCES

Variation from the plumb in the lines
and surfaces of columns, walls and arises

In adjacent masonry units	1/8 inch
In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch

Variations from the plumb for external corners,
expansion joints, and other conspicuous lines

In 20 feet	1/4 inch
In 40 feet or more	1/2 inch

Variations from the level for exposed lintels,

sills, parapets, horizontal grooves, and other conspicuous lines

In 20 feet	1/4 inch
In 40 feet or more	1/2 inch

Variation from level for bed joints and top surfaces of bearing walls

In 10 feet	1/4 inch
In 40 feet or more	1/2 inch

Variations from horizontal lines

In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch

Variations in cross sectional dimensions of columns and in thickness of walls

Minus	1/4 inch
Plus	1/2 inch

3.2.7 Cutting and Fitting

Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units and concrete form masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Openings in the masonry shall be made carefully so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Reinforced masonry lintels shall be provided above openings over 300 mm (12 inches) wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

3.2.8 Jointing

Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

3.2.8.1 Flush Joints

Joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall. Joints in unpergared masonry

walls below grade shall be pointed tight. Flush joints for architectural units, such as fluted units, shall completely fill both the head and bed joints.

3.2.8.2 Tooled Joints

Joints in exposed exterior and interior masonry surfaces shall be tooled [slightly concave] [_____]. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

3.2.8.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 10 mm. (3/8 inch.) On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 10 mm. (3/8 inch.)

3.2.9 Joint Widths

Joint widths shall be as follows:

3.2.9.1 Concrete Masonry Units and Concrete Form Masonry Units

Concrete masonry units and concrete form masonry units shall have 10 mm (3/8 inch) joints, except for prefaced concrete masonry units and concrete form masonry units.

3.2.9.2 Prefaced Concrete Masonry Units Concrete Form Masonry Units

Prefaced concrete masonry units and concrete form masonry units shall have a joint width of 10 mm (3/8 inch) wide on unfaced side and not less than 5 mm (3/16 inch) nor more than 6 mm (1/4 inch) wide on prefaced side.

3.2.9.3 Brick

Brick joint widths shall be the difference between the actual and nominal dimensions of the brick in either height or length. Brick expansion joint widths shall be as shown.

3.2.10 Embedded Items

Spaces around built-in items shall be filled with mortar unless otherwise embedded in concrete fill. Openings around flush-mount electrical outlet boxes in wet locations shall be pointed with mortar. Anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in shall be embedded as the masonry work progresses. Anchors, ties and joint reinforcement shall be fully embedded in the mortar or concrete fill. Cells receiving anchor bolts and cells of the first course below bearing plates shall be filled with grout or concrete fill.

3.2.11 Unfinished Work

Unfinished work shall be stepped back for joining with new work. Tothing may be resorted to only when specifically approved. Loose mortar shall be

removed and the exposed joints shall be thoroughly cleaned before laying new work.

3.2.12 Masonry Wall Intersections

Each course shall be masonry bonded at corners and elsewhere as shown. Masonry walls shall be anchored or tied together at corners and intersections with bond beam reinforcement and prefabricated corner or tee pieces of joint reinforcement as shown.

3.2.13 Partitions

Partitions shall be continuous from floor to underside of floor or roof deck where shown. Openings in firewalls around joists or other structural members shall be filled as indicated or approved. Where suspended ceilings on both sides of partitions are indicated, the partitions other than those shown to be continuous may be stopped approximately 100 mm (4 inches) above the ceiling level. An isolation joint shall be placed in the intersection between partitions and structural or exterior walls as shown. Interior partitions having 100 mm (4 inch) nominal thick units shall be tied to intersecting partitions of 100 mm (4 inch) units, 125 mm (5 inches) into partitions of 150 mm (6 inch) units, and 175 (7 inches) into partitions of 200 mm (8 inch) or thicker units. Cells within vertical plane of ties shall be filled solid with grout for full height of partition or solid masonry units may be used. Interior partitions having masonry walls over 100 mm (4 inches) thick shall be tied together with joint reinforcement. Partitions containing joint reinforcement shall be provided with prefabricated pieces at corners and intersections or partitions.-

3.3 ANCHORED VENEER CONSTRUCTION

The inner and outer wythes shall be completely separated by a continuous airspace as shown on the drawings. Both the inner and the outer wythes shall be laid up together except when adjustable joint reinforcement assemblies are approved for use. When both wythes are not brought up together, through-wall flashings shall be protected from damage until they are fully enclosed in the wall. The airspace between the wythes shall be kept clear and free of mortar droppings by temporary wood strips laid on the wall ties and carefully lifted out before placing the next row of ties. A coarse gravel or drainage material shall be placed behind the weep holes in the cavity to a minimum depth of 100 mm (4 inches) of coarse aggregate or 250 mm (10 inches) of drainage material to keep mortar droppings from plugging the weep holes.

3.4 WEEP HOLES

Weep holes shall be provided not more than 600 mm (24 inches) on centers in mortar joints of the exterior face shell of CFMU and elsewhere at the exterior wythe above wall flashing, over foundations, bond beams, and any other horizontal interruptions of the cavity. [Weep holes shall be formed by placing short lengths of well-greased No. 10, 8 mm (5/16 inch) nominal diameter, braided cotton sash cord in the mortar and withdrawing the cords after the wall has been completed.] [Weep holes shall be constructed using weep hole ventilators.] Other approved methods may be used for providing weep holes. Weep holes shall be kept free of mortar and other obstructions.

3.5 COMPOSITE WALLS

Masonry wythes shall be tied together with joint reinforcement or with unit wall ties. Facing shall be anchored to concrete backing with wire dovetail anchors set in slots built in the face of the concrete as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. The facing wythe shall be anchored or tied to the backup at a maximum spacing of 400 mm (16 inches) on center vertically and 600 mm (24 inches) on center horizontally. Unit ties shall be spaced not over 600 mm (24 inches) on centers horizontally, in courses not over 400 mm (16 inches) apart vertically, staggered in alternate courses. Ties shall be laid not closer than 16 mm (5/8 inch) to either masonry face. Ties shall not extend through control joints. Collar joints between masonry facing and masonry backup shall be filled solidly with grout.

3.6 PREFACED CONCRETE MASONRY UNITS AND CONCRETE FORM MASONRY UNITS

Prefaced concrete masonry units and concrete form masonry units shall be installed as specified for concrete masonry units and concrete form masonry units and as required herein. Single-faced units may be installed through the wall where walls or partitions are indicated to have structural clay facing unit finish on one side only. The facing shall be used for dimensional and plane reference in the installation. Two-faced walls or partitions shall consist of two prefaced CMU units bonded and tied together as specified for composite walls, or a CFMU with prefaced face shells on both faces. Wainscots shall be of full courses to approximate as nearly as possible the height indicated, except that in no case shall the wainscots be lower than 50 mm (2 inches) below the specified height. Units shall be set level and true so that bases and walls will present true planes and surfaces free of waviness, offset, or other distortion. Joint reinforcing shall be placed not over 400 mm (16 inches) on center vertically.

3.7 GLASS BLOCK

Glass block shall be installed as recommended by the glass block manufacturer and as specified in paragraph ENVIRONMENTAL REQUIREMENTS, after coordinating the work with other trades to accommodate embedded items.

3.8 CERAMIC GLAZED STRUCTURAL CLAY FACING UNITS

Ceramic glazed structural clay facing units shall be at set level and true so that bases and wall surfaces will present true planes with finished surfaces free of waviness, off-sets, or other distortions.

3.9 MORTAR

Mortar shall be mixed in a mechanically operated mortar mixer for at least 3 minutes, but not more than 5 minutes. Measurement of ingredients for mortar shall be by volume. Ingredients not in containers, such as sand, shall be accurately measured by the use of measuring boxes. Water shall be mixed with the dry ingredients in sufficient amount to provide a workable mixture which will adhere to the vertical surfaces of masonry units. Mortar that has stiffened because of loss of water through evaporation shall be retempered by adding water to restore the proper consistency and workability. Mortar that has reached its initial set or that has not been used within [2-1/2] [_____] hours after mixing shall be discarded.

3.10 REINFORCING STEEL

Reinforcement shall be cleaned of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond prior to placing grout. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement shall be placed prior to grouting. Unless otherwise indicated, vertical wall reinforcement shall extend to within 50 mm (2 inches) of tops of walls.

3.10.1 Positioning Bars

Vertical bars shall be accurately placed within the cells at the positions indicated on the drawings. A minimum clearance of 13 mm (1/2 inch) shall be maintained between the bars and masonry units. Minimum clearance between parallel bars shall be one diameter of the reinforcement. Vertical reinforcing may be held in place using bar positioners or CFMU cross members located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement. Column and pilaster ties shall be wired in position around the vertical steel. Ties shall be in contact with the vertical reinforcement and shall not be placed in horizontal bed joints.

3.10.2 Splices

Bars embedded in mortar shall be lapped a minimum of 48 diameters of the reinforcement; bars embedded in concrete shall be lapped a minimum of 40 diameters of the reinforcement. Welded or mechanical connections shall develop at least 125 percent of the specified yield strength of the reinforcement.

3.11 JOINT REINFORCEMENT

Joint reinforcement shall be installed at 400 mm (16 inches) on center or as indicated. In CFMU walls, joint reinforcing shall be installed in the first course above and below wall openings or as indicated. Reinforcement shall be lapped not less than 150 mm. (6 inches.) Prefabricated sections shall be installed at corners and wall intersections. The longitudinal wires of joint reinforcement shall be placed to provide not less than 16 mm (5/8 inch) cover to either face of the unit.

3.12 PLACING GROUT

Cells containing reinforcing bars shall be filled with grout. Hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces shall be filled solid with grout. Cells under lintel bearings on each side of openings shall be filled solid with grout for full height of openings. Walls below grade, lintels, and bond beams shall be filled solid with grout. Units other than open end units may require grouting each course to preclude voids in the units. Grout not in place within 1-1/2 hours after water is first added to the batch shall be discarded. Sufficient time shall be allowed between grout lifts to preclude displacement or cracking of face shells of masonry units. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, the wall shall be torn down and rebuilt.

3.12.1 Vertical Grout Barriers for Fully Grouted Walls

Grout barriers shall be provided not more than 10 m (30 feet) apart, or as required, to limit the horizontal flow of grout for each pour.

3.12.2 Horizontal Grout Barriers

Grout barriers shall be embedded in mortar below cells of hollow units receiving grout.

3.12.3 Grout Holes and Cleanouts

3.12.3.1 Grout Holes

Grouting holes shall be provided in slabs, spandrel beams, and other in-place overhead construction. Holes shall be located over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Additional openings spaced not more than 400 mm (16 inches) (16 inches) on centers shall be provided where grouting of all hollow unit masonry is indicated. Openings shall not be less than 100 mm (4 inches) in diameter or 75 by 100 mm (3 by 4 inches) in horizontal dimensions. Upon completion of grouting operations, grouting holes shall be plugged and finished to match surrounding surfaces.

3.12.3.2 Cleanouts for Hollow Unit Masonry Construction

Cleanout holes shall be provided at the bottom of every pour in cores containing vertical reinforcement when the height of the grout pour exceeds 1.5 m. (5 feet.) Where all cells are to be grouted, cleanout courses shall be constructed using bond beam units in an inverted position to permit cleaning of all cells. Cleanout holes shall be provided at a maximum spacing of 800 mm (32 inches) (32 inches) where all cells are to be filled with grout. A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanouts shall not be less than 75 by 100 mm (3 by 4 inch) openings cut from one face shell. Manufacturers standard cutout units may be used at the Contractors option. Cleanout holes shall not be closed until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

3.12.3.3 Cleanouts for Solid Unit Masonry Construction

Cleanouts for construction of walls consisting of a grout filled cavity between solid masonry wythes shall be provided at the bottom of every pour by omitting every other masonry unit from one wythe. A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanout holes shall not be plugged until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

3.12.4 Grouting Equipment

3.12.4.1 Grout Pumps

Pumping through aluminum tubes will not be permitted. Pumps shall be operated to produce a continuous stream of grout without air pockets, segregation, or contamination. Upon completion of each days pumping, waste

materials and debris shall be removed from the equipment, and disposed of outside the masonry.

3.12.4.2 Vibrators

Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. At least one spare vibrator shall be maintained at the site at all times. Vibrators shall be applied at uniformly spaced points not further apart than the visible effectiveness of the machine. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing segregation.

3.12.5 Grout Placement

Masonry shall be laid to the top of a pour before placing grout. Grout shall not be placed in two-wythe solid unit masonry cavity until mortar joints have set for at least 3 days during hot weather and 5 days during cold damp weather. Grout shall not be placed in hollow unit masonry until mortar joints have set for at least 24 hours. Grout shall be placed using a hand bucket, concrete hopper, or grout pump to completely fill the grout spaces without segregation of the aggregates. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. The height of grout pours and type of grout used shall be limited by the dimensions of grout spaces as indicated in Table III. Low-lift grout methods may be used on pours up to and including 1.5 m (5 feet) in height. High-lift grout methods shall be used on pours exceeding 1.5 m (5 feet) in height.

3.12.5.1 Low-Lift Method

Grout shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. Mortar protruding more than 13 mm (1/2 inch) into the grout space shall be removed before beginning the grouting operation. Grout pours 300 mm (12 inches) or less in height shall be consolidated by mechanical vibration or by puddling. Grout pours over 300 mm (12 inches) in height shall be consolidated by mechanical vibration and reconsolidated by mechanical vibration after initial water loss and settlement has occurred. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. Low-lift grout shall be used subject to the limitations of Table III.

3.12.5.2 High-Lift Method

Mortar droppings shall be cleaned from the bottom of the grout space and from reinforcing steel. Mortar protruding more than 6 mm (1/4 inch) into the grout space shall be removed by dislodging the projections with a rod or stick as the work progresses. Reinforcing, bolts, and embedded connections shall be rigidly held in position before grouting is started. CMU units shall not be pre-wetted. Grout, from the mixer to the point of deposit in the grout space shall be placed as rapidly as practical by pumping and placing methods which will prevent segregation of the mix and cause a minimum of grout splatter on reinforcing and masonry surfaces not being immediately encased in the grout lift. The individual lifts of grout shall be limited to 1.2 m (4 feet) in height. The first lift of grout shall be placed to a uniform height within the pour section and vibrated thoroughly to fill all voids. This first vibration shall follow immediately behind the pouring of the grout using an approved mechanical vibrator. After a waiting period sufficient to permit the grout to become plastic, but before it has

taken any set, the succeeding lift shall be poured and vibrated 300 to 450 mm (12 to 18 inches) into the preceding lift. If the placing of the succeeding lift is going to be delayed beyond the period of workability of the preceding, each lift shall be reconsolidated by reworking with a second vibrator as soon as the grout has taken its settlement shrinkage. The waiting, pouring, and reconsolidation steps shall be repeated until the top of the pour is reached. The top lift shall be reconsolidated after the required waiting period. The high-lift grouting of any section of wall between vertical grout barriers shall be completed to the top of a pour in one working day unless a new series of cleanout holes is established and the resulting horizontal construction joint cleaned. High-lift grout shall be used subject to the limitations in Table III.

TABLE III

POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

Maximum Grout Pour Height (m) (4)	Grout Type	Grouting Procedure	Minimum Dimensions of the Total Clear Areas Within Grout Spaces and Cells (mm) (1,2)	
			Multiwythe Masonry (3)	Hollow-unit Masonry
0.3	Fine	Low Lift	20	40 x 50
1.5	Fine	Low Lift	50	50 x 75
2.4	Fine	High Lift	50	50 x 75
3.6	Fine	High Lift	65	65 x 75
7.3	Fine	High Lift	75	75 x 75
0.3	Coarse	Low Lift	40	40 x 75
1.5	Coarse	Low Lift	50	65 x 75
2.4	Coarse	High Lift	50	75 x 75
3.6	Coarse	High Lift	65	75 x 75
7.3	Coarse	High Lift	75	75 x 100

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TABLE III

POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

Maximum Grout Pour Height (feet) (4)	Grout Type	Grouting Procedure	Minimum Dimensions of the Total Clear Areas Within Grout Spaces and Cells (in.) (1,2)	
			Multiwythe Masonry (3)	Hollow-unit Masonry
1	Fine	Low Lift	3/4	1-1/2 x 2
5	Fine	Low Lift	2	2 x 3
8	Fine	High Lift	2	2 x 3
12	Fine	High Lift	2-1/2	2-1/2 x 3
24	Fine	High Lift	3	3 x 3
1	Coarse	Low Lift	1-1/2	1-1/2 x 3
5	Coarse	Low Lift	2	2-1/2 x 3

8	Coarse	High Lift	2	3 x 3
12	Coarse	High Lift	2-1/2	3 x 3
24	Coarse	High Lift	3	3 x 4

Notes: (1) The actual grout space or cell dimension must be larger than the sum of the following items: a) The required minimum dimensions of total clear areas given in the table above; b) The width of any mortar projections within the space; c) The horizontal projections of the diameters of the horizontal reinforcing bars within a cross section of the grout space or cell.

- (2) The minimum dimensions of the total clear areas shall be made up of one or more open areas, with at least one area being 20 mm (3/4 inch) or greater in width.
- (3) For grouting spaces between masonry wythes.
- (4) Where only cells of hollow masonry units containing reinforcement are grouted, the maximum height of the pour shall not exceed the distance between horizontal bond beams.

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3.13 PLACING CONCRETE FILL IN CFMU

Concrete shall be placed as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Before placing concrete, verify that cavities to be filled have proper alignment and are free from debris, obstructions, and mortar droppings that would create voids in the concrete pour. Cavities shall not be wetted down prior to pouring. Cavities shall be filled solidly in concrete lifts not to exceed 12 feet. Pours should be stopped 36 mm (1-1/2 inches) below the top of the cavity to form key points for the next concrete lift. Consolidate concrete immediately after pouring by mechanical vibration to eliminate voids. Extreme care shall be maintained to keep concrete fill from staining the face of masonry units, and stains should be removed immediately. Do not place concrete if temperature of CFMU is at or below -12 degrees C (10 degrees F). If the temperature is at freezing or will be near freezing within 24 hours of placement, insulate top of wall with fiberglass batts or insulation blankets. Cover CFMU walls at end of day with plastic sheets to keep out moisture and help in the hydration process. Concrete can be installed in a light rain condition but not in a heavy rain that could weaken the concrete and create voids in the fill. Sufficient time shall be allowed between concrete lifts to preclude displacement or cracking of CFMU face shells. If blowouts, flowouts, misalignment, or cracking of face shells occur during construction, the wall shall be torn down to below the point of failure and rebuilt.

3.13.1 Concrete Fill Equipment

3.13.1.1 Concrete Pumps

Pumping through aluminum tubes will not be permitted. Pumps shall be operated to produce a continuous stream of concrete without air pockets, segregation, or contamination. Upon completion of each days pumping, waste materials and debris shall be removed from the equipment, and disposed of outside the masonry.

3.13.1.2 Vibrators

Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the concrete. At least one spare vibrator shall be maintained at the site at all times. Vibrators shall be applied at uniformly spaced points not further apart than the visible effectiveness of the machine. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing segregation.

3.13.2 Concrete Fill Placement

Masonry shall be laid to the top of a pour before placing concrete. Concrete shall not be placed until mortar joints have set for at least 24 hours. Concrete grout shall be placed using a hand bucket, concrete hopper, or grout pump to completely fill the grout spaces without segregation of aggregates. Concrete shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the concrete. Mortar droppings shall be cleaned from the bottom of the cavity and from reinforcing steel. Mortar protruding more than [13 mm (1/2 inch)] [6 mm (1/4 inch)] into the cavity shall be removed before beginning the concrete fill operation. Reinforcing, bolts, and embedded connections shall be rigidly held in position before grouting is started. Pours 300 mm (12 inches) or less in height shall be consolidated by mechanical vibration or by puddling. Pours over 300 mm (12 inches) in height shall be consolidated by mechanical. Vibrators shall not be inserted into lower pours that are in a semi-solidified state.

3.14 BOND BEAMS

Bond beams shall be filled with grout and reinforced as indicated on the drawings. Grout barriers shall be installed under bond beam units to retain the grout as required. Reinforcement shall be continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated on the drawings. Where splices are required for continuity, reinforcement shall be lapped 48 bar diameters. A minimum clearance of 13 mm (1/2 inch) shall be maintained between reinforcement and interior faces of units.

3.15 CONTROL JOINTS (DOES NOT APPLY TO CFMU)

Control joints shall be provided as indicated and shall be constructed by using [mortar to fill the head joint] [special control-joint units] [sash jamb units with control joint key] [open end stretcher units] in accordance with the details shown on the drawings. Control joints in CFMU shall be provided as indicated and shall be constructed in accordance with the details shown on the drawings. Sash jamb units shall have a 19 by 19 mm (3/4 by 3/4 inch) (3/4 by 3/4 inch) groove near the center at end of each unit. The vertical mortar joint at control joint locations shall be continuous, including through all bond beams. This shall be accomplished by utilizing half blocks in alternating courses on each side of the joint. The control joint key shall be interrupted in courses containing continuous bond beam steel. In single wythe exterior masonry walls, the exterior control joints shall be raked to a depth of 20 mm; (3/4 inch;) backer rod and sealant shall be installed in accordance with Section 07900 JOINT SEALING. Exposed interior control joints shall be raked to a depth of 6 mm (1/4 inch). Concealed control joints shall be flush cut.

3.16 EXPANSION JOINTS FOR CONCRETE MASONRY VENEER AND CFMU-

Brick expansion joints and concrete masonry veneer joints shall be provided and constructed as shown on the drawings. Joints shall be kept free of mortar and other debris. Through wall expansion joints shall be provided and constructed as shown on the drawings. Joints shall be constructed by placing a plastic divider panel in the concrete fill cavity to break the bond. Joints shall be kept free of mortar and other debris. Backer rod and sealant shall be installed in accordance with Section 07900 JOINT SEALING.

3.17 SHELF ANGLES

Shelf angles shall be adjusted as required to keep the masonry level and at the proper elevation. Shelf angles shall be galvanized. Shelf angles shall be provided in sections not longer than 3 m (10 feet) and installed with a 6 mm (1/4 inch) gap between sections. Shelf angles shall be mitered and welded at building corners with each angle not shorter than 1.2 m, (4 feet,) unless limited by wall configuration.

3.18 LINTELS

3.18.1 Masonry Lintels

Masonry lintels shall be constructed with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated on the drawings. Lintel reinforcement shall extend beyond each side of masonry opening 40 bar diameters or 600 mm, (24 inches,) whichever is greater. Reinforcing bars shall be supported in place prior to grouting and shall be located 15 mm (1/2 inch) above the bottom inside surface of the lintel unit.

3.18.2 Precast Concrete and Steel Lintels

Precast concrete and steel lintels shall be as shown on the drawings. Lintels shall be set in a full bed of mortar with faces plumb and true. Steel and precast lintels shall have a minimum bearing length of 200 mm (8 inches) (8 inches) unless otherwise indicated on the drawings.

3.19 SILLS AND COPINGS

Sills and copings shall be set in a full bed of mortar with faces plumb and true.

3.20 ANCHORAGE TO CONCRETE AND STRUCTURAL STEEL

3.20.1 Anchorage to Concrete

Anchorage of masonry to the face of concrete columns, beams, or walls shall be with dovetail anchors spaced not over 400 mm (16 inches) (16 inches) on centers vertically and 600 mm (24 inches) (24 inches) on center horizontally.

3.20.2 Anchorage to Structural Steel

Masonry shall be anchored to vertical structural steel framing with adjustable steel wire anchors spaced not over 400 mm (16 inches) (16 inches)

on centers vertically, and if applicable, not over 600 mm (24 inches) (24 inches) on centers horizontally.

3.21 PARGING

The outside face of below-grade exterior concrete-masonry unit walls enclosing usable rooms and spaces, except crawl spaces, shall be parged with type S mortar. Parging shall not be less than 13 mm (1/2 inch) thick troweled to a smooth dense surface so as to provide a continuous unbroken shield from top of footings to a line 150 mm (6 inches) below adjacent finish grade, unless otherwise indicated. Parging shall be covered at junction of wall and footing. Parging shall be damp-cured for 48 hours or more before backfilling. If CMU cavity wall system is used as Contractors option to CFMU system, exterior face of interior CMU wythe shall be parged with type S mortar. Parging shall not be less than 12 mm (1/2 inch) thick troweled to a smooth dense surface so as to provide a continuous unbroken shield for full height of wall. Parging shall be protected from freezing temperatures until hardened.

3.22 RIGID BOARD-TYPE INSULATION

Anchored veneer walls shall be insulated, where shown, by installing board-type insulation on the cavity side of the inner wythe. Board type insulation shall be applied directly to the masonry or thru-wall flashing with adhesive. Insulation shall be neatly fitted between obstructions without impaling of insulation on ties or anchors. The insulation shall be applied in parallel courses with vertical joints breaking midway over the course below and shall be applied in moderate contact with adjoining units without forcing, and shall be cut to fit neatly against adjoining surfaces.

3.23 SPLASH BLOCKS

Splash blocks shall be located as shown.

3.24 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, mortar and grout daubs or splashings shall be completely removed from masonry-unit surfaces that will be exposed or painted. Before completion of the work, defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Immediately after grout work is completed, scum and stains which have percolated through the masonry work shall be removed using a stiff bristled brush. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

3.24.1 Concrete Masonry Unit, Concrete Form Masonry Unit, and Concrete Brick Surfaces

Exposed concrete masonry unit, concrete form masonry unit, and concrete brick surfaces shall be dry-brushed at the end of each days work and after any required pointing, using stiff-fiber bristled brushes.

3.24.2 Clay or Shale Brick Surfaces

Exposed clay or shale brick masonry surfaces shall be cleaned as necessary to obtain surfaces free of stain, dirt, mortar and grout daubs, efflorescence, and discoloration or scum from cleaning operations. After cleaning, the sample panel of similar material shall be examined for discoloration or stain as a result of cleaning. If the sample panel is discolored or stained, the method of cleaning shall be changed to assure that the masonry surfaces in the structure will not be adversely affected. The exposed masonry surfaces shall be water-soaked and then cleaned with a solution proportioned 30 milliliters (1/2 cup) trisodium phosphate and 30 milliliters (1/2 cup) laundry detergent to 1 liter (one gallon) of water or cleaned with a proprietary masonry cleaning agent specifically recommended for the color and texture by the clay products manufacturer. The solution shall be applied with stiff fiber brushes, followed immediately by thorough rinsing with clean water. Proprietary cleaning agents shall be used in conformance with the cleaning product manufacturers printed recommendations. Efflorescence shall be removed in conformance with the brick manufacturers recommendations.

3.24.3 Prefaced Concrete Masonry Unit and Concrete Form Masonry Unit Surfaces

Prefaced concrete masonry unit and concrete form masonry unit surfaces shall be cleaned with soap powder and clean water applied with stiff fiber brushes. Excess mortar shall be removed with wood paddles. Metal cleaning tools, metal brushes, abrasive powders, and acid solutions shall not be used. At the completion of cleaning operations, the surfaces shall be rinsed with clean water. In areas of traffic within the building, a barricade of wood supported by framing lumber shall be erected to protect the units. In other areas, a heavy kraft-type building paper shall be taped over the units until final acceptance.

3.25 BEARING PLATES

Bearing plates for beams, joists, joist girders and similar structural members shall be set to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. Bedding mortar and non-shrink grout shall be as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

3.26 PROTECTION

Facing materials shall be protected against staining. Top of walls shall be covered with nonstaining waterproof covering or membrane when work is not in progress. Covering of the top of the unfinished walls shall continue until the wall is waterproofed with a complete roof or parapet system. Covering shall extend a minimum of 600 mm (2 feet) down on each side of the wall and shall be held securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

3.27 TEST REPORTS

3.27.1 Field Testing of Mortar

At least three specimens of mortar shall be taken each day. A layer of mortar 13 to 16 mm (1/2 to 5/8 inch) thick shall be spread on the masonry

units and allowed to stand for one minute. The specimens shall then be prepared and tested for compressive strength in accordance with ASTM C 780.

3.27.2 Field Testing of Grout

Field sampling and testing of grout shall be in accordance with the applicable provisions of ASTM C 1019. A minimum of three specimens of grout per day shall be sampled and tested. Each specimen shall have a minimum ultimate compressive strength of 13.8 MPa (2000 psi) at 28 days.

3.27.3 Prism Tests

At least one prism test sample shall be made for each 465 square meters (5,000 square feet) of wall but not less than three such samples shall be made for any building. Three prisms shall be used in each sample. Prisms shall be tested in accordance with ASTM E 447. Seven-day tests may be used provided the relationship between the 7- and 28-day strengths of the masonry is established by the tests of the materials used. Compressive strength shall not be less than [_____] MPa ([_____] psi) ([_____] psi) at 28 days. If the compressive strength of any prism falls below the specified value by more than 3.5 MPa, (500 psi,) steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. If the likelihood of low-strength masonry is confirmed and computations indicate that the load-carrying capacity may have been significantly reduced, tests of cores drilled, or prisms sawed, from the area in question may be required. In such case, three specimens shall be taken for each prism test more than 3.5 MPa (500 psi) below the specified value. Masonry in the area in question shall be considered structurally adequate if the average compressive strength of three specimens is equal to at least 85 percent of the specified value, and if the compressive strength of no single specimen is less than 75 percent of the specified value. Additional testing of specimens extracted from locations represented by erratic core or prism strength test results shall be permitted.

3.27.4 Field Testing of Concrete Fill

Field sampling and testing of concrete fill shall be in accordance with Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

-- End Of Section --