

**DIVISION 4 - MASONRY**

SECTION 04200 - UNIT MASONRY

04200.0100 GENERAL

1. The work under this Section is subject to all applicable provisions of the "Bidding Requirements", the "Conditions of the Contract", "Contract Forms" and Division 1 - "General Requirements", which form a part hereof whether attached hereto or not.

0400.0200 WORK INCLUDED

1. Include all labor, materials and appliances and perform all operations in connection with the installation of all masonry and related work, complete, in strict accordance with the Contract Drawings and Schedule of Finishes, as specified herein or reasonably implied, in general as follows:
  - a. Concrete Masonry Units: For interior and exterior reinforced bearing walls and cavity as shown and detailed on the drawings.
  - b. Brick masonry unit veneer including all ties, etc.
  - c. All truss type reinforcing and steel rebar reinforcing, bearing plates, anchor bolts, eye and pintle masonry ties, etc. as noted on the drawings.
  - d. Expansion joints as shown on the drawings.
  - e. Furnishing and building in of anchors, ties, clamps, clips, etc., as required for work of this Section.
  - f. Mortar beds and grouting for saddles, windows, doors, louver frames, and similar items as noted on the drawings.
  - g. Scaffolding, hoists, centers, shoring, bracing, etc., as required for work under this Section.
  - h. Cleaning and pointing.
  - i. Clean-up and removal of rubbish, etc.
  - j. Do all cutting and patching, etc.
  - k. The masonry contractor shall install all necessary items that are required in the work and supplied by others, including: bolts, nailing blocks, inserts, anchors, flashing, lintels, expansion joints, conduits, etc.

0400.0300 QUALITY ASSURANCE

1. Tests:

Manufacturer or supplier of masonry units shall submit to Architect prior to delivery, certification of compliance of units with specified standards, as determined by an acceptable testing agency conforming to the applicable requirements of ASTM E329. Brick shall be tested in accordance with ASTM C67, and concrete masonry units in accordance with ASTM C140. If tests made after delivery indicate that units do not conform to specified requirements, costs of such tests shall be borne by the supplier.

2. Masonry cements:

Proprietary masonry cement mixes used in engineered masonry construction shall be subject to laboratory testing to assure compliance with minimum requirements for strength and bond.

3. Sample panels:

Erect sample panels for each type of masonry required, approximately 4 ft. long by 4 ft. high, showing the proposed color range, texture, bond, mortar, and quality of work. The sample panel, when accepted, shall become the project standard for bond, mortar, quality of work, and appearance. Do not begin work until panel is accepted by Architect.

0400.0400 SUBMITTALS

1. Samples:

Submit samples of each type of masonry unit and each accessory item required. Provide certification of pull-out strength of all masonry ties and anchors. Submit certification of compliance with required standards for all masonry units.

2. Shop Drawings:

Provide shop drawings of custom sized and shaped precast Brick as detailed on the drawings.

0400.0500 PRODUCT DELIVERY, STORAGE AND HANDLING

1. Delivery:

Deliver masonry units to job site in undamaged condition. Deliver and handle units to prevent chipping, breaking, or other damage.

2. Storage:

Store masonry units off ground and protected from wetting by capillary action, rain, or snow, and protected from mud, dust, or other materials and contaminants likely to cause staining or defects.

0400.0600 JOB CONDITIONS

1. Cold weather construction:

Masonry construction performed when ambient temperature falls below 40 degrees F. shall conform to the Recommended Practices and Guide Specifications for Cold Weather Masonry Construction published by the International Masonry Industry All-Weather Council.

2. Coverings:

The Contractor shall construct and maintain temporary protection as required to permit continuous progress of the work. During construction, partially completed walls which are not enclosed or sheltered shall be kept dry by covering at the end of each day and when work is not in progress with strong, weather-resistant material extended a minimum of 2 ft. down each side, and held securely in place.

3. Protections:

Do not apply uniform floor or roof loads for at least 12 hours or concentrated loads for at least 3 days after building masonry walls or columns.

4. Staining:

Prevent grout or mortar from staining the face of masonry to be left exposed or to be painted. Remove immediately any grout or mortar in contact with face of such masonry. Protect all sills, ledges, and projections from droppings of mortar. Protect door jambs and corners from damage during construction.

1. Materials

a. Portland cement:

ASTM C150, Type II

b. Lime:

Hydrated lime, ASTM C207, Type S.

c. Sand:

ASTM C144.

d. Aggregates:

ASTM C404.

e. Water:

Mixing water must be clean and free of harmful amounts of acids, alkalis, organic materials, or other substances that would adversely affect the quality or appearance of the mortar or the masonry units.

f. Brick and Stone:

1. Veneer Brick shall be ASTM C216, Grade SW, Type 1 wire cut nominal; 4" x 4" x 12' as manufactured by Interstate Brick Co. or equal. Submit sample of Brick and Stone. Provide brick similar in color, texture, and physical properties to those available for inspection at the Architect's office. Do not exceed variations in color and texture of samples accepted by the Architect.
2. Stone accents and rockface shall be Rock Cast Stone. or equal color. Provide all samples, sizes and finishes for all interior and exterior stone as indicated and noted in the drawings.

g. Hollow loadbearing CMU:

ASTM C90, Grade N, Type 1, Normal weight.

h. Hollow non-loadbearing CMU:

ASTM C129, Type II, Light weight.

i. Provide bond beams with two (2) #5 3,000 psi concrete where indicated.

j. Reinforcement:

Steel reinforcing shall conform to the following ASTM Specifications:

1. Cold-drawn steel wire, ASTM A82.
2. Welded steel wire fabric, ASTM A185.
3. Billet steel deformed bars, ASTM A615, Grade 60.

k. Material for anchors and ties:

All anchors and ties shall be coated or corrosion-resistant metal meeting or exceeding the following ASTM Specifications:

1. Zinc coating of flat metal, ASTM A153.
2. Zinc coating of wire, ASTM A116, Class 3.
3. Copper-coated wire, ASTM B227, grade 30HS.
4. Stainless steel, ASTM A167, Type 304.

l. Types of anchors and ties:

Provide the following types of anchors and ties for masonry construction:

1. Wire mesh: Minimum 20 gauge, 1/2 in. mesh, galvanized wire, and 1 in. less in width than width of masonry.
2. Corrugated veneer anchors: Minimum 22 gauge, minimum 7/8 in. wide x 6 in. long.
3. Cavity wall ties: Shall be eye & pintle type minimum 3/16 in. wire diameter with drip, rectangular, at least 2 in. wide, or Z-shaped with 2 in. legs, length sufficient to allow 1 in. minimum mortar coverage of ends or legs. At all veneer space 16" vertical & horizontal staggered.
4. Joint reinforcement: Prefabricated welded joint reinforcement, longitudinal

cross tie wire minimum 9-gauge spaced 16 in. on center; ladder or truss-type design.

5. Dovetail flat bar anchors: Minimum 16 gauge, 7/8 in. minimum width, corrugated, turned up 1/4 in. at end, or with 1/2 in. hole within 1/2 in. of end of bar.
6. Wire anchors: Wire anchors shall be minimum 3/16 in. diameter.
7. Rigid anchors for intersecting bearing walls: 1 1/2 in. wide x 1/4 in. thick x 24 in. minimum length; turn up ends minimum 2 in. or provide cross pins.
8. Wire ties for grouted reinforced masonry: Minimum 9-gauge wire bent into rectangular stirrups 4 in. wide and 2 in. shorter than overall wall thickness; form so that tie ends meet in center of one embedded end of stirrup.

## 2. Mixes

### a. Mortar mixes:

Mortar shall comply with the minimum requirements of ASTM C270, Type M for Arriscraft units use a Portland cement-lime based mortar mix, proportioned to a 1:1:6 ratio, where 1 part Portland cement is mixed with 1 part Type S hydrated mason's lime and 6 parts masonry sand. This mixture shall be properly mixed with the appropriate quantity of water to result in a Type N mortar as specified in CSA A179-94; Mortar and Grout for Unit Masonry, and ASTM C270-95a; Standard Specifications for Mortar for Unit Masonry.

### b. Admixtures:

No air-entraining admixtures or materials containing air-entraining admixtures shall be used. No antifreeze compounds or other substances shall be added to mortar or grout. No calcium chloride shall be included in mortar or grout in which metal reinforcing or accessories will be embedded. Mortar colors shall consist of inorganic compounds not to exceed 15% of the weight of the cement except that carbon black shall not exceed 3% of the weight on the cement. If mortar colors are used in reinforced masonry, the ultimate compressive strength of the masonry shall be determined by prism tests.

## 0400.0800 EXECUTION

### 1. Preparation

#### a. Inspection:

Inspect surfaces that are to support masonry work to assure completion to proper lines and grades free of all dirt and other deleterious material. Do not begin work until surfaces not properly prepared have been satisfactorily corrected.

## 2. Field Quality Control

### a. Mortar and grout:

Mix mortar and grout in accordance with the proportion requirements of ASTM C270, and ASTM C476 as applicable. Control batching procedure to ensure proper proportions by measuring materials by volume. Amount of mixing water and mortar consistency shall be controlled by mason. Retempering will be permitted only within the first 2 1/2 hours of initial mix. Any mortar or grout that has partially set shall be discarded.

### b. Allowable tolerances:

1. Maximum variation from plumb in lines and surfaces of columns, walls, and arises shall not exceed 1/4 in. 10 ft.; 3/8 in. in any story or 20 ft. maximum; or 1/2 in. in 40 ft.
2. Maximum variation from plumb for external corners, expansion joints, and other conspicuous lines shall not exceed 1/4 in. in any story or 20 ft. maximum; or 1/2 in. in 40 ft.
3. Maximum variation from level or grades for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines shall not exceed 1/4 in. in any bay or 20 ft. maximum; or 1/2 in. in 40 ft.
4. Maximum variation of linear building line from an established position in plan and related portions of columns, walls, and partitions shall not exceed 1/2 in. in any bay or 20 ft. maximum; or 3/4 in. in 40 ft.
5. Maximum variation of linear building line from an established position in plan and related portions of columns, walls, and partitions shall not exceed 1/2 in. in any bay or 20 ft. maximum; or 3/4 in. in 40 ft.

### c. Anchors and ties:

Remove all dirt, ice, loose rust, and scale prior to installation.

### d. Protection of work:

Protect sills, ledges, and offsets from mortar droppings or other damage during construction. Remove misplaced mortar or grout immediately. Protect face

materials against staining. Protect door jambs and corners from damage during construction.

## 2. Installing Masonry

### a. Preparation:

Verify that initial absorption rate of clay brick is less than 0.025 oz. /sq. in. per minute. Brick with absorption rates in excess of this amount shall be wetted with clean water 24 hours prior to placement until unit is nearly saturated, and shall be surface dry when laid. During freezing weather, units that require wetting shall be sprinkled with warm or hot water just before laying. No wetting of concrete unit masonry is permitted.

### b. Installation:

Do not install cracked, broken, or chipped masonry units exceeding ASTM allowances. Use masonry saws to cut and fit exposed units. Lay brick plumb, true to line, and with level courses accurately spaced within allowable tolerances. Unless otherwise shown on the drawings, install masonry work using 1/2 running bond. Stop horizontal runs at end of workday by racking back in each course; toothing will not be permitted. Adjust units to final position while mortar is soft and plastic. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar, and re-lay with fresh mortar. Adjust shelf angles to keep work level and at proper elevation. When joining fresh masonry to set or partially set masonry, remove loose unit and mortar, and clean and lightly wet exposed surface of set masonry prior to laying fresh masonry. The mason shall place all accessories and reinforcement in the masonry as the job progresses. Place horizontal joint reinforcement in first bed joint and each successive third joint of concrete masonry walls to prevent cracking. Cooperate with other trades to assure proper location of anchors, inserts, penetrations, etc.

### c. Built-in items:

Install bolts, anchors, nailing blocks, inserts, frames, vent flashing, conduit, and other built-in items as masonry work progresses. Avoid cutting and patching. Solidly grout spaces around built-in items. Provide joints around exterior framed openings 1/4 to 3/8 in. wide, raked and tooled smooth to a uniform depth of 3/4 in., ready for caulking by others. Build chases in, do not cut. Install chases minimum of one masonry unit length from jambs.

### d. Joints:

Provide nominal joint thickness of 3/8 in. for concrete unit masonry, 3/8 in. for brick masonry. Do not furrow bed joints for solid masonry units. Provide face-

shell bedding for concrete unit masonry except at grouted cells and base course, where full mortar bedding is required. Construct uniform joints. Provide full head and bed joints, shoved tight to prevent penetration of moisture. Provide weather-proof, concave, tooled joints in exposed surfaces when mortar is thumbprint hard, using round jointing tool. Strike joints flush in surfaces to be plastered, stucco, or covered with other material or surface-applied finish other than paint. Concave tool exterior joints below grade. Remove mortar protruding into cells or cavities to be grouted. Do not permit mortar droppings to fall into cavities of multi-wythe walls or to block weep holes. Fill with mortar all horizontal joints between top of masonry partitions and underside of concrete beams. Keep movement joints clean of all mortar and debris. For tuckpointing, rake mortar joints to a depth of 1/2 to 3/4 in., saturate with clean water, fill solidly with pointing mortar, and tool to match existing joints. Cut first course of CMU at each level with wet saw as required for bed joints to align with veneer joints.

e. Flashing & Damp Proofing:

Provide through-wall flashing at base of all cavity walls; at shelf angles; at lintels, heads, and sills of openings in exterior walls; at all locations shown on the drawings; and at any other locations as required to complete the integrity of waterproofed or dampproofed surfaces. Form dams at horizontal termination of all flashing.

Clean surface of masonry smooth and free from projections that might puncture or otherwise damage flashing membrane. Carefully fit flashing around projections and where dampproof membrane abuts columns, walls, etc. Neatly fold and bed in mastic or mortar so as to direct moisture to the outside. Form membrane to required profiles and install in such a manner as to force any moisture entering the wall to the outside. Hold outer edge of membrane to surface with mastic or mortar. Lap joints 4 in. and seal with mastic or embed in mortar. Form membrane to correct profile without wrinkles or buckles, and protect from punctures and tears during installation. Field cut units at 8/12 ratio at straight wall flashing where roofs intersect with masonry veneer.

Prior to installation of veneer brick and thin brick systems, the entire exterior face of CMU shall be damp proofed with Tamms Dehydrate 75 Emulsified Asphalt Damp Proofing Compound or equal, one (1) coat application.

f. Weep holes:

Provide weep holes in head joints in first course immediately above all flashing. Leave head joint free and clean of mortar or install weep hole tube in head joint. Space weep holes 24 in. on center maximum for brick masonry, and 24 in. on center maximum for Arriscraft. Keep weep holes and area above flashing free of mortar droppings. For backfill material behind retaining walls, and for loose fill

insulation in walls, screen cavity side of weep hole against clogging before fill material is placed.

g. Masonry bonding:

Bond facing and backing of multi-wythe walls as shown on the drawings with masonry headers extended a minimum of 3 in. into backing. If single header does not extend through wall, overlap headers from opposite sides of wall at least 3 in. Provide minimum number of wall headers equal to 4% of wall surface, spaced maximum distance of 24 in. on center either vertically or horizontally.

For multi-wythe walls of hollow concrete masonry units, bond inner and outer wythes by transverse lapping of stretcher unit at least 3 in. over units below, spaced maximum 32 in. on center vertically; or lap with stretcher units at least 50% wider than unit below, spaced maximum 16 in. on center vertically. Bond abutting or intersecting walls and partitions with at least 50% of units at the intersection laid in masonry bond. Provide a minimum of 3 in. of bearing of alternate units on unit below. Masonry bonding is not permitted for grouted or reinforced construction.

h. Metal-tie bonding:

Provide metal ties for bonding of multi-wythe walls as shown on the drawings. Stagger ties in alternate courses, and provide minimum of one tie for each 4.5 sq. ft. of wall surface. Maximum distance between adjacent ties not to exceed 18 in. vertically or 24 in. horizontally. Embed ties in horizontal joints of facing and backing. Provide additional ties within 12 in. of openings, spaced maximum 36 in. around perimeter.

In lieu of metal ties, contractor may use continuous prefabricated metal joint reinforcement as specified, spaced not more than 16 in. on center vertically.

For corner intersections of walls carried up separately, provide rigid steel anchors at maximum vertical spacing of 32 in. When intersecting bearing or shear walls are carried up separately, provide rigid steel anchors at a maximum vertical spacing of 2 ft.

Anchor nonbearing partitions abutting or intersecting other walls or partitions with cavity wall ties at vertical spacing not to exceed 4 ft.

i. Anchoring brick veneer:

Attach brick veneer to backing with metal veneer ties spaced maximum 16 in. on center vertically and horizontally with a minimum of one tie for each 2 sq. ft. of wall area. Embed ties at least 2 in. in horizontal joint of facing. Provide additional ties within 12 in. of openings, spaced maximum 36 in. around perimeter.

j. Expansion and contraction:

Provide vertical movement joints where called for on the drawings at intervals of not more than 20 ft. on centers, and at all offsets, returns, openings, and intersections with dissimilar materials. Provide continuous bond break at steel columns and members. Provide pressure-relieving joints by placing a continuous 1/8 in. neoprene pad below shelf angles.

3. Reinforced Masonry

a. Masonry strength:

Provide minimum ultimate compressive strength of 1,500 psi.

b. Reinforcement:

Hold vertical reinforcement firmly in place by means of frames or other suitable devices. Place horizontal reinforcement as masonry work progresses. Provide minimum clear distance between longitudinal bars equal to nominal diameter of bar. Provide minimum clear distance between bars in columns equal to 1 1/2 times bar diameter. Minimum thickness of mortar or grout between masonry and reinforcement shall be 1/4 in., except than 1/4 in. bars may be laid in 1/2 in. horizontal mortar joints, and 6-gauge or smaller wires may be laid in 3/8 in. mortar joints. Collar joints containing both horizontal and vertical reinforcement shall have a minimum width 1/2 in. larger than the sum of the diameters of the horizontal and vertical reinforcement.

c. Low-lift grouting:

For grout spaces less than 2 in. width, place grout at maximum 24-in. intervals in lifts of 6 to 8 in. as the wall is built. Assure that grout core is clean of mortar, mortar droppings, and debris. Agitate grout during and after placement to assure complete filling and coverage of reinforcement. If work is to be stopped for 1 hour or more, hold grout 1 1/2 in. below top of masonry. Continue grouting to top of finished wall.

d. High-lift grouting:

For grout spaces 2 in. or more in width, grout may be placed in lifts not to exceed 4 ft. For running bond, provide one metal tie for each 3 sq. ft. of wall with maximum spacing of 16 in. vertically and 24 or 32 in. horizontally for brick and concrete block respectively. For stack bond, provide one metal tie for each 2 sq. ft. of wall with maximum spacing 12 in. vertically and 24 in. horizontally for brick, or 16 in.

vertically and horizontally for concrete block.

Keep grout core clean. Provide cleanout holes in bottom course as required for inspection and cleaning. Replace cleanout plugs only after area to be grouted has been accepted. Do not place grout until the entire wall has been in place a minimum of 3 days. Place horizontal grout barriers at convenient intervals. If work is to be stopped for 1 hour or more, hold grout 1 1/2 in. below top of masonry. Continue grouting to top of finished wall.

e. Forms and shoring:

Provide substantial and tight forms to prevent leakage of mortar or grout. Brace or shore forms to maintain position and shape. Do not remove forms or shoring until masonry has hardened sufficiently to carry its own weight and any other temporary loads that may be placed on it during construction (10 days for girders and beams, 7 days for masonry slabs).

4. Cold-Weather Masonry Construction

a. Surface conditions:

Ice or snow that has formed on the masonry bed shall be thawed by application of heat. Apply heat carefully until top surface is dry to the touch. Any section of completed masonry work that is deemed frozen and damaged shall be removed before continuing construction of that section.

b. Condition of masonry units:

Use only dry masonry units, except as permitted below. Wet or frozen masonry units shall not be laid. No wetting of concrete masonry units will be permitted.

For brick masonry units used in cold-weather construction, initial rates of absorption may range to a maximum of 1 1/2 oz. When sprinkling is required to achieve proper rates, heated water shall be used. Water shall be above 70 degrees F. when temperature of units is above freezing and above 130 degrees F. when temperature of units is below freezing.

c. Construction requirements:

1. Air temperature 32 to 40 degrees F: Sand or mixing water shall be heated to produce mortar temperatures ranging from 40 to 120 degrees F.
2. Air temperature 25 to 32 degrees F: Sand and mixing water shall be heated to produce mortar temperatures ranging from 40 to 120 degrees F. Maintain temperature of mortar on boards above freezing.

3. Air temperature 20 to 25 degrees F: Sand and mixing water shall be heated to produce mortar temperatures ranging from 40 to 120 degrees F. Maintain mortar temperatures on boards above freezing. Provide sources of heat on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 15 mph.
4. Air temperature 20 degrees F. and below: Sand and mixing water shall be heated to provide mortar temperatures ranging from 40 to 120 degrees F. Enclosures and auxiliary heat shall be provided to maintain air temperature above freezing. Temperature of units when laid shall be not less than 20 degrees F.

d. Protection of completed work:

1. Mean ambient temperature 32 to 40 degrees F: Masonry completed or not being worked on shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.
2. Mean ambient temperature 25 to 32 degrees F: Masonry shall be completely covered with weather-resistive membrane for 24 hours.
3. Mean ambient temperature 20 to 25 degrees F: Masonry shall be completely covered with insulating blankets, or equally protected for 24 hours.
4. Mean ambient temperature 20 degrees F and below: Masonry temperature shall be maintained above freezing for 24 hours by enclosure and supplementary heat such as electric heating blankets, infrared heat lamps, or other approved methods.

5. Pointing and Cleaning

a. Pointing:

At final completion of masonry work, cut out any defective joints or holes in exposed masonry and repaint with mortar, tooling to match adjacent joints.

b. Cleaning:

Dry brush masonry surface after mortar has set at end of each workday and after final pointing. Clean exposed, unglazed masonry with stiff brush and clean water. Cleaning agents may be used only with written approval of Architect. Cleaning agents must be tested on sample wall area of 20 sq. ft. Protect adjacent materials from damage due to cleaning operations. Remove efflorescence in accordance with brick manufacturer's recommendations.

Leave work area and surrounding surfaces clean and free of mortar spots, droppings, and broken masonry.

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