

DIVISION 4

MASONRY

SECTION 4A

UNIT MASONRY

PART I GENERAL

4A1.01 GENERAL REQUIREMENTS

- A. Attention is directed to the printed form of the Contract and Division 1 of these specifications entitled "General Requirements", which are hereby made a part of this Section of the Specifications.
- B. Equality of material, article, assembly or system, other than those named or described in this Section will be determined in accordance with the provisions of the Contract Form.

4A1.02 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Requirements of this section apply to masonry work specified in Division-4 section "Reinforced Unit Masonry".

4A1.03 DESCRIPTION OF WORK:

- A. Extent of each type of masonry work is indicated on drawings and schedule.
- B. Types of masonry work required include:
 - 1. Concrete unit masonry.
 - 2. Limestone name panel (allowance).
 - 3. Glass block in unit masonry walls.

4A1.04 QUALITY ASSURANCE:

- A. Fire Performance Characteristics: Where indicated, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E 119 by a recognized testing and inspecting organization or by

another means, as acceptable to authority having jurisdiction.

- B. **Single Source Responsibility for Masonry Units:** Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- C. **Single Source Responsibility for Mortar Materials:** Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- D. **Field Constructed Mock Ups:** Prior to installation of masonry work, erect sample wall panels to further verify selections made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction; build mock-ups to comply with the following requirements:
1. Locate mock-ups on site in locations as directed by Architect.
 2. Build mock-ups for the following types of masonry in sizes of approximately 4' long by 6' high by full thickness including face and back-up wythes as well as accessories.

Typical exterior wall with concrete masonry units; Type A, Color 1; Type A, color 2 and Type B.
 3. Protect mock-ups from the elements with weather resistant membrane.
 4. Retain mock-ups during construction as standard for judging completed masonry work. When directed, demolish mock-ups and remove from site.

4A1.05 **SUBMITTALS:**

- A. **Product Data:** Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements.
- B. **Shop Drawings:** Submit cutting and setting drawings

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for stone trim showing sizes, profiles and locations of each unit required.

C. **Samples for Verification Purposes:** Submit the following samples:

1. **Unit masonry samples** for each type of exposed masonry unit required: include in each set the full range of exposed color and texture to be expected in completed work.
2. **Stone trim samples** not less than 12" in length showing full range of exposed color and texture to be expected in finish work.
3. **Colored masonry mortar samples** for each color required showing the full range of color which can be expected in the finished work. Label samples to indicate type and amount of colorant used.

4A1.06 **DELIVERY, STORAGE, AND HANDLING:**

- A. **Deliver masonry materials** to project in undamaged condition.
- B. **Store and handle masonry units** to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
 1. **Limit moisture absorption** of concrete masonry units during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U.S. Weather Bureau Station nearest project site.
- C. **Store cementitious materials** off the ground, under cover and in dry location.
- D. **Store aggregates** where grading and other required characteristics can be maintained.
- E. **Store masonry accessories** including metal items to prevent deterioration by corrosion and accumulation of dirt.

4A1.07 **PROJECT CONDITIONS:**

- A. **Protection of Work:** During erection, cover top of walls with heavy waterproof sheeting at end of each days' work. Cover partially completed structures when

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work is not in progress.

- B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.
- D. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.
- E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.
- F. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- G. Protect sills, ledges and projections from droppings of mortar.
- H. Do not lay masonry units which are wet or frozen.
- I. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
- J. Remove masonry damaged by freezing conditions.
- K. Perform the following construction procedures while the work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10oF (6oC).

1. 40 F (4 C) to 32 F (0 C):

Mortar: Heat mixing water to produce mortar temperature between 40oF (4oC) and 120oF (49oC).

Grout: Follow normal masonry procedures.

2. 32 F (0 C) to 25 F (-4 C):

Mortar: Heat mixing water and sand to produce mortar temperatures between 40oF (4oC) and 120oF (49oC); maintain temperature of mortar on

boards above freezing.

Grout: Heat grout materials to 90 F (32 C) to produce in place grout temperature of 70oF (21oC) at end of work day.

3. 25 F (-4 C) to 20 F (-7 C):

Mortar: Heat mixing water and sand to produce mortar temperatures between 40oF (4oC) and 120oF (49oC); maintain temperature of mortar on boards above freezing.

Grout: Heat grout materials to 90 F (32 C) to produce in place grout temperature of 70oF (21oC) at end of work day.

Heat: both sides of walls under construction using salamanders or other heat sources.

Use windbreaks or enclosures when wind is excess of 15 mph.

4. 20 F (-7 C) and below:

Mortar: Heat mixing water and sand to produce mortar temperatures between 40oF (4oC) and 120oF (49oC).

Grout: Heat grout materials to 90 F (32 C) to produce in place grout temperature of 70oF (21oC) at end of work day.

Masonry Units: Heat masonry units so that they are above 20oF (-7oC) at time of laying.

Provide enclosure and auxiliary heat to maintain an air temperature of at least 40oF (4oC) for 24 hours after laying units.

Do not heat water for mortar and grout to above 160oF (71oC).

L. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry temperature ranges apply to anticipated minimum night temperatures.

1. 40 F (4 C) to 32 F (0 C):

Protect masonry from rain or snow for at least 24 hours by covering with weather-resistant membrane.

2. 32 F (0 C) to 25 F (-4 C):

Completely cover masonry with weather-resistant membrane for at least 24 hours.

3. 25 F (-4 C) to 20 F (-7 C):

Completely cover masonry with weather-resistant insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.

4. 20 F (-7 C) and below:

Except as otherwise indicated, maintain masonry temperature above 32oF (0oC) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40oF (4oC) for 48 hours.

4A1.08 ALLOWANCES:

- A. Limestone: Furnish, deliver to a location in Boston for carving, pick up, and install Limestone Name Panel. Refer to Division-1, section Allowance.

PART II - PRODUCTS

4A2.01 CONCRETE MASONRY UNITS:

- A. General: Comply with referenced standards and other requirements indicated below. applicable to each form of concrete masonry unit required.
1. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 2. Provide square-edged units for outside corners, except where indicated as bullnose.
- B. Exterior, exposed units shall be terrazzo masonry units as manufactured by Trendstone, and split face masonry units as manufactured by Foster.

C. Concrete Block: Provide units complying with characteristics indicated below for Grade, Type, face size, exposed face and, under each form of block included, for weight classification.

1. Grade N.

2. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated.

3. Type I, moisture-controlled units.

Cure units by autoclave treatment at a minimum temperature of 350oF (176oC) and a minimum pressure of 125 psi.

4. Exposed Faces: Color and texture as indicated below.

Type A, Color 1: Foster Splitface, Granite Grey.

Type A, Color 2: Foster Splitface, Superior White.

Type B: Trendstone Groundface, Filled, Ramapo White.

Interior Use: Manufacturer's standard color and texture, to be painted.

C. Hollow Loadbearing Block: ASTM C 90 and as follows:

Weight Classification: Lightweight.

D. Solid Loadbearing Block: ASTM C 145 and as follows:

Weight Classification: Lightweight.

4A2.02 STONE TRIM UNITS:

A. Limestone: Indiana oolitic limestone as quarried in Lawrence, Monroe, and Owen Counties, Indiana, complying with ASTM C 568, Category II (medium density), and with the following Indiana Limestone Institute of America (ILI) requirements:

1. Color: Gray.

2. Grade: Select.

3. Finish: Smooth.

4. Cut stone accurately to shape and dimensions indicated, with exposed faces dressed true, beds and joints at right angles to face; comply with ILI fabricating tolerances.

B. Stone Anchors: Type and size indicated and, as required to securely anchor and fasten stonework in place. Fabricate anchors and dowels from AISI Type 302/304 stainless steel.

4A2.03 GLASS UNIT MASONRY

A. Solid Glass Block: Translucent blocks formed from clear colorless glass, of size indicated below:

1. Patterns: Clear.
2. Square Unit Sizes: 3" x 8" x 8".

4A2.04 MORTAR AND GROUT MATERIALS:

A. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.

1. For colored pigmented mortars use premixed colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Inert coloring pigment may be added to a maximum of 6% by weight of cement.

2. Available Products: Subject to compliance with requirements, masonry cements which may be incorporated in the work include, but are not limited to, the following:

"Atlas Custom Color Masonry Cement": Lehigh Portland Cement Co.

"Flamingo Color Masonry Cement": the Riverton Corporation.

3. For colored aggregate mortars use masonry cement of natural color or white as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144, except for joints

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less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.

1. **White Mortar Aggregates:** Natural white sand or ground white stone.
2. **Colored Mortar Aggregates:** Ground marble, granite or other sound stone, as required to match Architect's sample.

D. **Aggregate for Grout:** ASTM C 404.

1. **Colored Mortar Pigments:** Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

E. **Water:** Clean, and potable.

4A2.05 **JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES:**

A. **Materials:** Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:

1. **Austenitic Stainless Steel Wire:** ASTM A 580, AISI Type 304 (UNS S30400) alloy.

Application: Use for masonry exposed to exterior and in contact with earth.

2. **Austenitic Stainless Steel Sheet:** ASTM A 167 for AISI Type 304 (UNS S30400) alloy, No. 1 finish.

Application: Use for anchors.

B. **Joint Reinforcement:** As specified in Division-4 section Reinforced Unit Masonry and shown on the structural drawings.

C. **Masonry Veneer Anchors:** Two-piece assemblies which permit vertical or horizontal differential movement between wall and framework parallel to, plane of wall; consisting of wire tie section and metal anchor section for attachment over sheathing to metal studs and complying with the following requirements:

1. **Wire Size:** 0.25" diameter.
2. **Wire Tie Shape:** Rectangular.

3. Wire Tie Length: As required to extend within 1" of masonry veneer face.
- D. Anchor Section: Sheet metal plate, with screw holes top and bottom and with raised, rib-stiffened strap stamped into center to provide slot between strap and plate for connection of wire tie; of overall size and thickness indicated below:
1. Size: Plate and strap size: 1 1/4" wide for plate, 5/8" for strap x lengths indicated below; slot clearance formed between face of plate and back of strap at maximum rib projection: 1/32" + diameter of wire tie.

Plate and Strap Lengths: 8" and 5 1/2".
 2. Thickness: 0.1046" (12 gage).
- E. Metal Fasteners for Steel Studs: Steel drill screws, #10 diameter x length required to penetrate steel stud flange by not less than 3 exposed threads, complying with ASTM C 954 except with hex washer head and neoprene washer, cadmium-plated.

4A2.06 CONCEALED FLASHING MATERIALS:

- A. Sheet Metal Flashing: Fabricate from the following metal complying with requirements specified in division-7 section "Flashing and Sheet Metal" and below:
1. Stainless Steel: 0.015" thick.
- B. Solder and Sealants for Sheet Metal Flashings: As specified in Division-7 section "Flashing and Sheet Metal".

4A2.07 MISCELLANEOUS MASONRY ACCESSORIES:

- A. Non-Metallic Expansion Joint Strips: Premolded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41E1, capable of compression up to 35%, of width and thickness indicated.
- B. Premolded Control Joint Strips: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Polyvinyl chloride complying with ASTM D 2287, General Purpose Grade, Designation PVC-63506.
- C. **Bond Breaker Strips:** Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. **Weepholes:** Provide the following for weepholes:
1. **Plastic Tubing:** Medium density polyethylene, outside diameter and length as indicated below:
1/4" x 4".

4A2.08 **MASONRY CLEANERS:**

- A. **Job-mixed Detergent Solution:** Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.
- B. Verify acceptability of masonry cleaner with specified masonry products.

4A2.09 **MORTAR AND GROUT MIXES:**

- A. **General:** Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.
- B. Do not use calcium chloride in mortar or grout.
- C. **Mixing:** Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.
- D. **Mortar for Unit Masonry:** Comply with ASTM C 270, Proportion Specification, for types of mortar required, unless otherwise indicated.
1. Limit cementitious materials in mortar to portland cement-lime.
 2. Use Type M mortar for masonry below grade and in contact with earth, and where indicated.
 3. Use Type S mortar for reinforced masonry and where indicated.
 4. Use Type N mortar for exterior, above grade

loadbearing and non-loadbearing walls; for interior loadbearing walls; and for other applications where another type is not indicated.

- E. **Colored Pigmented Mortar:** Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.
- F. **Colored Aggregate Mortar:** Produce mortar of color required by use of colored aggregates in combination with selected cementitious materials.
 - 1. Mix to match Architect's sample.
- G. **Grout for Unit Masonry:** Comply with ASTM C 476 for grout for use in construction of reinforced and nonreinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.
 - 1. Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.
 - 2. Use coarse grout in grout spaces 2" or more in least horizontal dimension, unless otherwise indicated.

PART III - EXECUTION

4A3.01 INSTALLATION, GENERAL:

- A. Do not wet concrete masonry units.
- B. **Cleaning Reinforcing:** Before placing, remove loose rust, ice and other coatings from reinforcing.
- C. **Thickness:** Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.
- D. **Build chases and recesses** as shown and as required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- E. Leave openings for equipment to be installed before

completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

- F. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full units without cutting where possible.

1. Use dry cutting saws to cut concrete masonry units.

4A3.02 CONSTRUCTION TOLERANCES:

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arrises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 1/2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 1/2" maximum.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1/16" within width of a single unit.
- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20' maximum, nor 3/4" in 40' or more.
- D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 1/2".
- E. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

4A3.03 LAYING MASONRY WALLS:

- A. Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint widths and to accurately locate openings, movement-type joints,

returns and offsets. Avoid the use of less-than-half size units at corners, jambs and wherever possible at other locations.

- B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.
- C. **Pattern Bond:** Lay exposed masonry in the bond pattern shown, or if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.
- D. **Stopping and Resuming Work:** Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

4A3.04 MORTAR BEDDING AND JOINTING:

- A. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- B. Set stone units in full bed of mortar with all vertical joints slushed full. Fill dowel, anchor and similar holes solid. Wet stone joint surface thoroughly before setting; for stone surfaces which are soiled, clean bedding and exposed surfaces with fiber brush and soap powder followed by thorough rinsing with clear water.
- C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not otherwise shown, lay walls with 3/8" joints.
- D. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.

- E. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.
- F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar, and reset in fresh mortar.

4A3.05 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY:

- A. Structural Reinforcement is specified under Division-4 section Reinforced Unit Masonry, and shown on the structural drawings.

4A3.06 HORIZONTAL JOINT REINFORCING:

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6".
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.
- D. Reinforce the following walls with continuous horizontal joint reinforcement:
 - Single wythe walls.
 - Multi-wythe walls with one or more stack bond wythes.
 - Hollow concrete masonry walls.
 - Multi-wythe masonry walls.
- E. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- F. Space continuous horizontal reinforcement as follows:
 - 1. As specified in Division-4 section Reinforced Unit Masonry and as shown on the structural drawings.
- G. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in

2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.

1. In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

4A3.07 ANCHORING MASONRY WORK:

A. General: Provide anchor devices of type indicated.

B. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1" in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24" o.c. vertically and 36" o.c. horizontally.

C. Anchor single wythe masonry veneer to metal studs with masonry veneer anchors to comply with the following requirements:

1. Fasten each anchor section through sheathing to metal studs with 2 metal fasteners of type indicated.
2. Embed tie section in masonry joints. Provide not less than 1" air space between back of masonry veneer wythe and face of sheathing.
3. Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.
4. Space anchors as indicated but not more than 16" o.c. vertically and 24" o.c. horizontally. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 3'-0".

4A3.08 CONTROL AND EXPANSION JOINTS:

- A. **General:** Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in related masonry accessory items as the masonry work progresses.
- B. Build flanges of metal expansion strips into masonry. Lap each joint 4" in direction of flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.
- C. Build flanges of factory-fabricated expansion joint units into masonry. See Division-7 section "Elastic Expansion Joints".
- D. Build-in non-metallic joint fillers where indicated.
- E. Build in horizontal pressure relieving joints where indicated; construct joints by either leaving an air space or inserting non-metallic compressible joint filler of width required to permit installation of sealant and backer rod.
 - 1. Locate horizontal pressure relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

4A3.09 LINTELS:

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and wherever openings of more than 1'-0" for brick size units and 2'-0" for block size units are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.
 - 1. For hollow concrete masonry unit walls, use specially formed "U"-shaped lintel units with reinforcing bars placed as shown filled with coarse grout.
- C. Provide minimum bearing of 8" at each jamb unless otherwise indicated.

4A3.10 FLASHING OF MASONRY WORK:

- A. **General:** Provide concealed flashings in masonry work

at, or above, all shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drip.

- B. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.
- C. Interlock end joints of deformed metal flashings by overlapping deformations not less than 1-1/2" and seal lap with elastic sealant.
- D. Provide weepholes in the head joints of the first course of masonry immediately above concealed flashings. Space 24" o.c., unless otherwise indicated.
- E. Install reglets and nailers for masonry flashing and other related work where shown to be built into masonry work.

4A3.11 INSTALLATION OF REINFORCED UNIT MASONRY:

- A. Refer to Division-4 sections "Reinforced Unit Masonry" for installation requirements applicable to reinforced unit masonry.

4A3.12 FIELD QUALITY CONTROL:

- A. Owner will employ separate testing laboratory to perform field quality control testing.

4A3.13 REPAIR, POINTING AND CLEANING:

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended.

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Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

- B. **Pointing:** During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.
- C. **Final Cleaning:** After mortar is thoroughly set and cured, clean masonry as follows:
- D. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
- E. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
- F. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
- G. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
- H. Use bucket and brush hand cleaning method described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
 - 1. Detergent.
- J. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins
- K. Clean limestone units to comply with recommendations in "ILI Handbook" published by Indiana Limestone Institute of America.
- L. **Protection:** Provide final protection and maintain conditions in a manner acceptable to Installer, which ensure unit masonry work being without damage and deterioration at time of substantial completion.

END OF SECTION 4A

DIVISION 4

MASONRY

SECTION 4B

REINFORCED UNIT MASONRY

PART I GENERAL

4B1.01 GENERAL REQUIREMENTS

- A. Attention is directed to the printed form of the Contract and Division 1 of these specifications entitled "General Requirements", which are hereby made a part of this Section of the Specifications.
- B. Equality of material, article, assembly or system, other than those named or described in this Section will be determined in accordance with the provisions of the Contract Form.

4B1.02 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Requirements of Section "Unit Masonry" apply to work of this section.

4B1.03 DESCRIPTION OF WORK:

- A. Extent of each type of reinforced unit masonry work is indicated on drawings and in schedules.

4B1.04 SUBMITTALS:

- A. Mill Certificates: Submit steel producer's certificates of mill analysis, tensile and bend tests for reinforcement steel required for project.
- B. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures." Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

PART II - PRODUCTS

4B2.01 MATERIALS:

- A. General: Refer to Section "Unit Masonry" for masonry materials and accessories not included in this section.
- B. Reinforcement Bars: Provide deformed bars to the following grades complying with ASTM A 615, except as otherwise indicated.
 - 1. Provide Grade 60 for all bars.
 - 2. Shop-fabricate reinforcement bars which are shown to be bent or hooked.

PART III - EXECUTION

4B3.01 PLACING REINFORCEMENT:

- A. General: Clean reinforcement loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.
- B. Position reinforcing accurately at the spacing indicated. Support secure vertical bars against displacement. Horizontal reinforcing may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1" (whichever is greater).
 - 1. For columns, piers and pilasters, provide a clear distance between vertical bars as indicated, but not less than 1-1/2 times the nominal bar diameter or 1-1/2", whichever is greater. Provide lateral ties as indicated.
- C. Splice reinforcement bars where shown; do not splice at other points unless acceptable to the Architect. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
 - 1. Provide not less than minimum lap indicated, or if not indicated, as required by governing code.

- D. Weld splices where shown. Comply with the requirements of AWS D1.4 for welding materials and procedures.
- E. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 5/8" on exterior face of walls and 1/2" at other locations.
- F. Embed prefabricated horizontal joint reinforcing as the work progresses, with a minimum cover of 5/8" on exterior face of walls and 1/2" at other locations. Lap units not less than 6" at ends. Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- G. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.
 - 1. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

4B3.02 INSTALLATION, GENERAL:

- A. Refer to Section "Unit Masonry" for general installation requirements to unit masonry.
- B. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.
 - 1. Construct formwork to conform to shape, line and dimensions shown. Make sufficiently tight to prevent leakage of mortar grout, or concrete (if any). Brace, tie and support as required to maintain portion and shape during construction and curing of reinforced masonry.
- C. Do not remove forms and shores until reinforced masonry member has hardened sufficiently to carry its own weight and all other reasonable temporary loads that may be placed on them during construction.
 - 1. Allow not less than the following minimum time to elapse after completion of members before removing shores or forms, provided suitable curing conditions have been obtained during the curing period.

10 days for girders and beams.
7 days for slabs.
7 days for reinforced masonry soffits.

4A3.03 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY:

A. General:

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

Where solid CMU units are shown, lay with full mortar head and bed joints.

B. Walls:

1. Pattern Bond: Lay CMU wall units in 1/2 running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

C. Columns, Piers and Pilasters:

1. Use CMU units of the size, shape and number of vertical core spaces shown. If not shown, use units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.
2. Provide pattern bond shown, or if not shown, alternate head joints in vertical alignment.
3. Where bonded pilaster construction is shown, lay wall and pilaster units together to maximum pour height specified.

D. Grouting:

1. Use "Fine Grout" per ASTM C 476 for filling spaces less than 4" in both horizontal directions.
2. Use "Course Grout" per ASTM C 476 for filling 4" spaces or larger in both horizontal directions.
3. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to the requirements which follow.

E. Low-Lift Grouting:

1. Provide minimum clear dimension of 2" and clear area of 8 sq. in. in vertical cores to be grouted.
2. Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required to allow for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 10 ft.
3. Lay CMU to maximum pour height. Do not exceed 5' height, or if bond beam occurs below 5' height stop pour at course below bond beam.
4. Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2" below top course of pour.
5. Bond Beams: Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcing in bond beams; lap at corners and

intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

F. High-Lift Grouting:

1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension is 3" and 10 sq.in., respectively.

2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout.

Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.

3. Construct masonry to full height of maximum grout pour specified, prior to placing grout.

Limit grout lifts to a maximum height of 5' and grout pour to a maximum height of 24', for single wythe hollow concrete masonry walls, unless otherwise indicated.

4. Place vertical reinforcement before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 10'.

Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcing bar, pull loops and bar to proper position and tie free ends.

5. Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing indicated.

6. Place horizontal beam reinforcement as the masonry units are laid.

7. Embed lateral tie reinforcement in mortar joints

where indicated. Place as masonry units are laid, at the vertical spacing shown.

Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide not less than No. 2 bars or 8 gage wire ties spaced 16" o.c. for members with 20" or less side dimensions, and 8" o.c. for members with side dimensions exceeding 20".

8. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcing and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.
9. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.
10. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.
11. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 5'. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.

Place grout in lintels or beams over openings in one continuous pour.

12. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1" of vertically reinforced cavities, during construction of masonry.
13. When more than one pour is required to complete a

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given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1-1/2" of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

END OF SECTION 4B