For more information, contact ***Master Builders Solutions***; 23700 Chagrin Blvd., Beachwood, OH 44122; Phone: (800) 628-9990; email: admixtures@masterbuilders.com Website: <https://master-builders-solutions.com/en-us/specifications/>

Options are provided in square brackets. Delete those that are not necessary.

 Notes to the Specifier are provided in blue fonts. Delete the Notes in project specifications.

**SECTION 04 22 00**

**CONCRETE UNIT MASONRY**

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY
				1. Section Includes:

Concrete masonry units.

Decorative concrete masonry units.

Pre-faced concrete masonry units.

Mortar and grout.

Steel reinforcing bars.

Masonry-joint reinforcement.

Embedded flashing.

Miscellaneous masonry accessories.

Masonry-cell fill.

* + - * 1. Products Installed but not Furnished under This Section:

Cast-stone trim in concrete unit masonry.

* + - * 1. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Usually delete option in first subparagraph below and specify dovetail slots in concrete Section.

Section 03 10 00 "Concrete Forms and Accessories" for [**installing**] dovetail slots for masonry anchors.

Delete first subparagraph below if attachment of anchor sections to structural steel is included in this Section.

Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.

Section 07 19 00 "Water Repellents" for water repellents applied to unit masonry assemblies.

Coordinate first subparagraph below with referenced Section. Metal through-wall flashing is included in Section 076200 "Sheet Metal Flashing and Trim" and in this Section.

Section 07 62 00 "Sheet Metal Flashing and Trim" for [**exposed**] sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

Section 08 95 16 "Wall Vents" for wall vents (brick vents).

Section 32 32 23 "Segmental Retaining Walls" for dry-laid, concrete unit retaining walls.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited.

* + - * 1. CMU(s): Concrete masonry unit(s).
				2. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.
			1. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.
			1. ACTION SUBMITTALS
				1. Product Data: For each type of product.
				2. Sustainable Design Submittals:

"Product Certificates" Subparagraph below applies to LEED 2009, Materials and Resources Credit 5, "Regional Materials."

Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.

Retain first three subparagraphs below to be eligible for LEED v4 credit. See the Evaluations.

"Environmental Product Declaration" Subparagraph below applies to LEED v4 (all) MR Credit, "Building Product Disclosure and Optimization - Environmental Product Declarations." Confirm with manufacturer that EPDs are available for each product.

Environmental Product Declaration (EPD): For each product.

"Health Product Declaration" Subparagraph below applies to LEED v4 (all) MR Credit, "Building Product Disclosure and Optimization - Material Ingredients, Option 1 - Material Ingredient Reporting." Confirm with manufacturer that HPDs are available and meet requirements of the HPD Open Standard or approved USGBC program.

Health Product Declaration (HPD): For each product.

"Sourcing of Raw Materials" Subparagraph below applies to LEED v4 (all) MR Credit, "Building Project Disclosure and Optimization - Sourcing of Raw Materials, Option 1 - Raw Material Source and Extraction Reporting." Confirm with manufacturer that corporate sustainability reports are available, have been prepared within the last year or are applicable to the year of production, and are by an organization approved by the USGBC.

Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

"Product Certificates" Subparagraph below applies to IgCC, which requires that a minimum of 55 percent of building materials or products be extracted, harvested, manufactured, or recovered within 500 miles (800 km) of Project. See IgCC-2012, 505.2.5.

Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.

Retain "Environmental Product Declaration (EPD)" Subparagraph below if products specified in the Section are required to have an EPD to meet the IgCC's requirement of 55 percent recycled materials.

Environmental Product Declaration (EPD): For each product.

"Product Certificates" Subparagraph below applies to ASHRAE 189.1, which requires that a minimum of 15 percent of building materials or products be extracted, harvested, manufactured, or recovered within 500 miles (800 km) of Project. See ASHRAE 189.1-2014, 9.4.1.2.

Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.

"Environmental Product Declaration (EPD)" Subparagraph below applies to ASHRAE 189.1 if products specified in the Section are used to meet the requirements of paragraph 9.4.1.4, "Multiple-Attribute Product Declaration or Certification," which requires EPDs for a minimum of 10 products.

Environmental Product Declaration (EPD): For each product.

Subparagraphs below apply to Green Globes v1.4 if products specified in the Section are used to meet the requirements of paragraph 3.5.1.2 "Path B: Prescriptive Path for Building Core and Shell" which requires that a certain percentage of the materials used in the core and shell have EPDs, third-party certifications, and/or third-party life cycle assessments.

Environmental Product Declaration (EPD): For each product.

Third-Party Certifications: For each product.

Third-Party Certified Life Cycle Assessment: For each product.

* + - * 1. Shop Drawings: For the following:

Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI PRC-315. [**Show elevations of reinforced walls.**]

Retain "Fabricated Flashing" Paragraph below for flashing material that is specially fabricated for corners, end dams, etc.

Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

* + - * 1. Samples for Initial Selection:

Decorative CMUs, in the form of small-scale units.

Pre-faced CMUs.

Colored mortar.

Weep holes/vents.

Delete "Samples for Initial Selection" Subparagraph above if colors and other characteristics are preselected and specified or scheduled. Retain "Samples for Verification" Paragraph below with or without above.

* + - * 1. Samples for Verification: For each type and color of the following:

[**Exposed**] [**Decorative**] CMUs.

Pre-faced CMUs.

[**Pigmented**] [**and**] [**colored-aggregate**] mortar. Make Samples using same sand and mortar ingredients to be used on Project.

* + - 1. INFORMATIONAL SUBMITTALS

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 01 40 00 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

* + - * 1. Qualification Data: For testing agency.

Usually retain "Material Certificates" Paragraph below. Material certificates are required for all masonry constructed in accordance with TMS 402/602 (formerly ACI 530).

* + - * 1. Material Certificates: For each type and size of the following:

Masonry units.

Retain second option in first subparagraph below if required by authorities having jurisdiction or if the added assurance of quality that test reports provide is desired.

Include [**data on material properties**] [**material test reports substantiating compliance with requirements**].

Retain first subparagraph below only if retaining unit-strength method in "Performance Requirements" Article or if requirements for average net-area compressive strength of units are retained in Part 2.

For masonry units [**used in structural masonry**], include data and calculations establishing average net-area compressive strength of units.

Integral water repellent used in CMUs.

Cementitious materials. Include name of manufacturer, brand name, and type.

Mortar admixtures.

Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

Grout mixes. Include description of type and proportions of ingredients.

Reinforcing bars.

Joint reinforcement.

Anchors, ties, and metal accessories.

* + - * 1. Mix Designs: For each type of mortar [**and grout**]. Include description of type and proportions of ingredients.

Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.

Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

Retain "Statement of Compressive Strength of Masonry" Paragraph below only if retaining unit-strength method in "Performance Requirements" Article.

* + - * 1. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined in accordance with TMS 402/602.
				2. Cold-Weather [**and Hot-Weather**] Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.
			1. QUALITY ASSURANCE

Retain "Testing Agency Qualifications" Paragraph below if Contractor selects testing agency.

* + - * 1. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.
				2. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.

Build sample panels for [**each type of exposed unit masonry construction**] [**typical exterior wall**] [**typical interior wall**] [**typical exterior and interior walls**] in sizes approximately [**48 inches (1200 mm)**] [**60 inches (1500 mm)**] <**Insert dimension**> long by [**36 inches (900 mm)**] [**48 inches (1200 mm)**] <**Insert dimension**> high [**by full thickness**].

Build sample panels facing south.

Where masonry is to match existing, build panels adjacent and parallel to existing surface.

Protect approved sample panels from the elements with weather-resistant membrane.

Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

* + - * 1. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

Retain first subparagraph below for large-scale mockup or include in Section 01 40 00 "Quality Requirements." Indicate portion of wall represented by mockup on Drawings or draw mockup as separate element.

Build mockup [**of typical wall area**] as shown on Drawings.

Retain first subparagraph below for limited mockups.

Build mockups for [**each type of exposed unit masonry construction**] [**typical exterior wall**] [**typical interior wall**] [**typical exterior and interior walls**] in sizes approximately [**48 inches (1200 mm)**] [**60 inches (1500 mm)**] [**72 inches (1800 mm)**] [**96 inches (2400 mm)**] <**Insert dimension**> long by [**36 inches (900 mm)**] [**48 inches (1200 mm)**] [**60 inches (1500 mm)**] [**72 inches (1800 mm)**] <**Insert dimension**> high by full thickness, including face and backup wythes and accessories.

Include a sealant-filled joint at least 16 inches (400 mm) long in [**each**] [**exterior wall**] mockup.

Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.

Include through-wall flashing installed for a 24-inch (600-mm) length in corner of exterior wall mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit masonry above half of flashing).

Protect accepted mockups from the elements with weather-resistant membrane.

Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

Delete first two subparagraphs below if mockups are only for establishing appearance factors.

Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.

Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

Retain subparagraph below if the intention is to make an exception to the default requirement in Section 014000 "Quality Requirements" for demolishing and removing mockups.

Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

* + - 1. DELIVERY, STORAGE, AND HANDLING
				1. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

Delete first two paragraphs below if requiring Contractor to use preblended, dry mortar mix.

* + - * 1. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
				2. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

Always retain first paragraph below in case Contractor uses a preblended, dry mortar mix.

* + - * 1. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
				2. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
			1. FIELD CONDITIONS
				1. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

Increase extent of cover in subparagraph below as needed to suit local climatic conditions.

Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.

* + - * 1. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
				2. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

Protect sills, ledges, and projections from mortar droppings.

Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

* + - * 1. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602.

Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

* + - * 1. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602.
1. PRODUCTS

Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. MANUFACTURERS
				1. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
				2. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
			2. PERFORMANCE REQUIREMENTS

Retain this article for masonry designed by analytical methods when specifying masonry compressive strength rather than specifying compressive strength of masonry units and mortar. Revise paragraph below and insert required compressive strength of masonry if not indicated on Drawings. If retaining option, indicate on Drawings extent of structural unit masonry and nonstructural unit masonry.

* + - * 1. Provide [**structural**] unit masonry that develops indicated net-area compressive strengths at 28 days.

Retain one of two subparagraphs below.

Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) in accordance with TMS 402/602.

Determine net-area compressive strength of masonry by testing masonry prisms in accordance with ASTM C1314.

* + - 1. UNIT MASONRY, GENERAL
				1. Masonry Standard: Comply with TMS 402/602 except as modified by requirements in the Contract Documents.
				2. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work [**and will be within 20 feet (6 m) vertically and horizontally of a walking surface**].

See BIA Technical Notes 16B and NCMA TEK 7-3 for information on determining fire-resistance ratings of masonry walls.

* + - * 1. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

Retain subparagraph below if required by authorities having jurisdiction.

Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

* + - 1. CONCRETE MASONRY UNITS

"Regional Materials" Paragraph below applies to LEED 2009 NC, CS, and LEED 2009 for Schools Credit MR 5 and to LEED 2009 CI Credit MR 5, Option 2; before retaining, verify availability of materials that comply.

* + - * 1. Regional Materials: CMUs shall be manufactured within 500 miles (800 km) of Project site from aggregates [**and cement**] that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

"Regional Materials" Paragraph below applies to LEED 2009 CI Credit MR 5, Option 1.

* + - * 1. Regional Materials: CMUs shall be manufactured within 500 miles (800 km) of Project site.

"Regional Materials" Paragraph below applies to LEED v4.

* + - * 1. Regional Materials: CMUs shall be manufactured within 100 miles (160 km) of Project site from aggregates [**and cement**] that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.

"Indigenous Materials" Paragraph below applies to IgCC; before retaining, verify availability of materials that comply.

* + - * 1. Indigenous Materials: CMUs shall be manufactured within 500 miles (800 km) of Project site from aggregates [**and cement**] that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

"Regional Materials" Paragraph below applies to ASHRAE 189.1; before retaining, verify availability of materials that comply.

* + - * 1. Regional Materials: CMUs shall be manufactured within 500 miles (800 km) of Project site from aggregates [**and cement**] that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
				2. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

Provide [**square-edged**] [**bullnose**] units for outside corners unless otherwise indicated.

* + - * 1. Integral Water Repellent Admixture: Provide units made with integral water repellent [**for exposed units**] [**and**] [**where indicated**].

Integral Water Repellent Admixture: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested in accordance with ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 72 hours, shall show no visible water or leaks on the back of test specimen.

Retain "Basis-of-Design Product" Subparagraph and list of manufacturers below to require a specific product or a comparable product from manufacturers listed.

Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; [**MasterPel 240**] [**MasterPel 200HD**] or comparable product by one of the following:

<**Insert manufacturer's name**>.

* + - * 1. Insulated CMUs: Where indicated, units shall contain rigid, specially shaped, cellular thermal insulation units complying with ASTM C578, Type I, designed for installing in cores of masonry units.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Concrete Block Insulating Systems.

Shelter Enterprises Inc.

<**Insert manufacturer's name**>.

Copy and revise "CMUs" Paragraph below for nonload-bearing CMUs (changing ASTM C90 to ASTM C129) if needed; they are not usually an inventory item and may have to be ordered in large quantities. Indicate load-bearing and nonload-bearing units on Drawings if both are specified.

* + - * 1. CMUs: ASTM C90.

Usually retain "Unit Compressive Strength" Subparagraph below only for masonry designed by analytical methods; delete if retaining "Performance Requirements" Article. Also delete below if compressive strength specified in ASTM C90, which is 1900 psi (13.1 MPa), is acceptable. See the Evaluations.

Unit Compressive Strength: Provide units with minimum average net-area compressive strength of [**2150 psi (14.8 MPa)**] [**2800 psi (19.3 MPa)**] [**3050 psi (21.0 MPa)**] <**Insert value**>.

Retain one of first three options in "Density Classification" Subparagraph below or delete subparagraph for Contractor's option. Retain last option below for default requirement if using more than one weight. See the Evaluations.

Density Classification: [**Lightweight**] [**Medium weight**] [**Normal weight**] [**unless otherwise indicated**].

Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less-than-nominal dimensions.

Retain "Exposed Faces" Subparagraph below if color and texture of faces are critical. ASTM C90 requires at least four units for sample, representing the range of color and texture permitted.

Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

Retain "Faces to Receive Plaster" Subparagraph below if using direct application of portland cement or gypsum plaster.

Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

Concrete building bricks are often used to adjust dimensions in CMU construction.

* + - * 1. Concrete Building Brick: ASTM C55.

Usually retain "Unit Compressive Strength" Subparagraph below only for masonry designed by analytical methods; delete if retaining "Performance Requirements" Article. Also delete subparagraph if compressive strength specified in ASTM C55, which is 2500 psi (17.3 MPa), is acceptable. See the Evaluations.

Unit Compressive Strength: Provide units with minimum average net-area compressive strength of [**2800 psi (19.3 MPa)**] [**3050 psi (21.0 MPa)**] [**3750 psi (25.86 MPa)**] [**4050 psi (27.92 MPa)**] <**Insert value**>.

Retain one of three options in "Density Classification" Subparagraph below or delete subparagraph for Contractor's option.

Density Classification: [**Lightweight**] [**Medium weight**] [**Normal weight**].

Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by [**2-1/4 inches (57 mm)**] [**2-3/4 inches (70 mm)**] [**3-5/8 inches (92 mm)**] high by 7-5/8 inches (194 mm) long.

* + - * 1. Decorative CMUs: ASTM C90.

Usually retain "Unit Compressive Strength" Subparagraph below only for masonry designed by analytical methods; delete if retaining "Performance Requirements" Article. Also delete subparagraph if compressive strength specified in ASTM C90, which is 1900 psi (13.1 MPa), is acceptable. See the Evaluations.

Unit Compressive Strength: Provide units with minimum average net-area compressive strength of [**2150 psi (14.8 MPa)**] [**2800 psi (19.3 MPa)**] [**3050 psi (21.0 MPa)**] <**Insert value**>.

Density classification in "Density Classification" Subparagraph below affects appearance and water absorption. Verify availability of lightweight decorative CMUs before specifying.

Density Classification: [**Lightweight**] [**Medium weight**] [**Normal weight**].

Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph.

Pattern and Texture:

Retain one of first five subparagraphs below and revise to suit Project. Retain option if appearance is critical.

Standard pattern, ground-face finish. [**Match Architect's samples.**]

Standard pattern, split-face finish. [**Match Architect's samples.**]

Standard pattern, split-ribbed finish. [**Match Architect's samples.**]

Scored vertically so units laid in running bond appear as square units laid in stacked bond, standard finish. [**Match Architect's samples.**]

Triple scored vertically so units laid in running bond appear as vertical units laid in stacked bond (soldier courses), standard finish. [**Match Architect's samples.**]

Colors: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**].

Retain "Special Aggregate" Subparagraph below if special aggregate is required to match sample.

Special Aggregate: Provide units made with aggregate matching aggregate in Architect's sample.

Revise "Pre-faced CMUs" Paragraph below if medium- or normal-weight units are required.

* + - * 1. Pre-faced CMUs: Lightweight [**hollow**] [**solid**] concrete units complying with ASTM C90, with manufacturer's standard smooth resinous facing complying with ASTM C744.

Usually retain "Unit Compressive Strength" Subparagraph below only for masonry designed by analytical methods; delete if retaining "Performance Requirements" Article. Also delete subparagraph if compressive strength specified in ASTM C90, which is 1900 psi (13.1 MPa), is acceptable. See the Evaluations.

Unit Compressive Strength: Provide units with minimum average net-area compressive strength of [**2150 psi (14.8 MPa)**] [**2800 psi (19.3 MPa)**] [**3050 psi (21.0 MPa)**] <**Insert value**>.

Size: Manufactured to dimensions specified in "CMUs" Paragraph but with pre-faced surfaces having 1/16-inch- (1.5-mm-) wide returns of facing to create 1/4-inch- (6.5-mm-) wide mortar joints with modular coursing.

Colors and Patterns: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range**].

Insert other forms of block (e.g., sound absorbing or preinsulated) where required.

* + - 1. [**CONCRETE**] [**AND**] [**MASONRY**] LINTELS

Retain "General" Paragraph below if retaining more than one of the remaining paragraphs in article.

* + - * 1. General: Provide one of the following:

Retain one or more of three paragraphs below, depending on appearance desired.

* + - * 1. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. [**Provide lintels with net-area compressive strength not less than that of CMUs.**]
				2. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 03 30 00 "Cast-in-Place Concrete," and with reinforcing bars indicated.
				3. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
			1. MORTAR AND GROUT MATERIALS

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

"Regional Materials" Paragraph below applies to LEED 2009 NC, CS, and LEED 2009 for Schools, Credit MR 5 and to LEED 2009 CI Credit MR 5, Option 2; before retaining, verify availability of materials that comply.

* + - * 1. Regional Materials: Aggregate for mortar and grout [**, cement, and lime**] shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

"Regional Materials" Paragraph below applies to LEED 2009 CI Credit MR 5, Option 1.

* + - * 1. Regional Materials: Aggregate for mortar and grout [**, cement, and lime**] shall be manufactured within 500 miles (800 km) of Project site.

"Regional Materials" Paragraph below applies to LEED v4.

* + - * 1. Regional Materials: Aggregate for mortar and grout [**, cement, and lime**] shall be manufactured within 100 miles (160 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles (160 km) of Project site.

"Indigenous Materials" Paragraph below applies to IgCC; before retaining, verify availability of materials that comply.

* + - * 1. Indigenous Materials: Aggregate for mortar and grout [**, cement, and lime**] shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

"Regional Materials" Paragraph below applies to ASHRAE 189.1; before retaining, verify availability of materials that comply.

* + - * 1. Regional Materials: Aggregate for mortar and grout [**, cement, and lime**] shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
				2. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

Requirement in subparagraph below can help reduce the likelihood of efflorescence.

Alkali content shall not be more than 0.1 percent when tested in accordance with ASTM C114.

* + - * 1. Hydrated Lime: ASTM C207, Type S.

Mix in "Portland Cement-Lime Mix" Paragraph below allows better control of color than job-mixed, portland cement-lime mortar. If retaining below, also retain "Portland Cement" and "Hydrated Lime" paragraphs above.

* + - * 1. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
				2. Masonry Cement: ASTM C91/C91M.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Cemex S.A.B. de C.V.

Essroc.

Holcim (US) Inc.

Lafarge North America Inc.

Lehigh Hanson; HeidelbergCement Group.

<**Insert manufacturer's name**>.

* + - * 1. Mortar Cement: ASTM C1329/C1329M.

Manufacturers: Subject to compliance with requirements, provide products by the following:

Lafarge North America Inc.

<**Insert manufacturer's name**>.

Retain "Mortar Pigments" Paragraph below for colored cement or for pigments added at Project site.

* + - * 1. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

Retain "Basis-of-Design Product" Subparagraph and list of manufacturers below to require a specific product or a comparable product from manufacturers listed.

Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; MasterColor or comparable product by one of the following:

<**Insert manufacturer's name**>.

Mixes in "Colored Cement Products" Paragraph below allow better control of color than job-mixed colored mortar. If retaining, also retain paragraphs above that specify materials included in the mixes retained below.

* + - * 1. Colored Cement Products: Packaged blend made from [**portland cement and hydrated lime**] [**masonry cement**] [**or**] [**mortar cement**] and mortar pigments, all complying with specified requirements, and containing no other ingredients.

Colored Portland Cement-Lime Mix:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Essroc.

Holcim (US) Inc.

Lafarge North America Inc.

Lehigh Hanson; HeidelbergCement Group.

<**Insert manufacturer's name**>.

Colored Masonry Cement:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Cemex S.A.B. de C.V.

Essroc.

Holcim (US) Inc.

Lafarge North America Inc.

Lehigh Hanson; HeidelbergCement Group.

<**Insert manufacturer's name**>.

Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.

Retain one or both subparagraphs below to suit types of cement retained above. Percentages are for pigments containing only metallic oxides. If using pigments containing carbon black, carbon black must be limited to 2 percent of portland cement by weight or 1 percent of masonry or mortar cement.

Pigments shall not exceed 10 percent of portland cement by weight.

Pigments shall not exceed 5 percent of [**masonry cement**] [**or**] [**mortar cement**] by weight.

* + - * 1. Aggregate for Mortar: ASTM C144.

For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

For joints less than 1/4-inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

White-Mortar Aggregates: Natural white sand or crushed white stone.

Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

* + - * 1. Aggregate for Grout: ASTM C404.

Delete "Epoxy Pointing Mortar" Paragraph below if not needed for pre-faced CMUs, glazed brick, or glazed structural clay facing tile.

* + - * 1. Epoxy Pointing Mortar: ASTM C395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

"Cold-Weather Admixture" Paragraph below is an example of a requirement for a concrete admixture often used in cold weather as an antifreeze. Appendix X1 in ASTM C270 and BIA generally recommend not using admixtures unless they are known to have no adverse effects. Before approving the use of cold-weather admixtures, verify their acceptability by laboratory testing with mortar mix used.

* + - * 1. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

Retain "Basis-of-Design Product" Subparagraph and list of manufacturers below to require a specific product or a comparable product from manufacturers listed.

Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; [**MasterSet AC 534**] [**MasterSet FP 20**] or comparable product by one of the following:

<**Insert manufacturer's name**>.

Retain "Water-Repellent Admixture" Paragraph below if integral water repellent is used in CMUs.

* + - * 1. Water-Repellent Mortar Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

Retain "Basis-of-Design Product" Subparagraph and list of manufacturers below to require a specific product or a comparable product from manufacturers listed.

Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; [**MasterPel 240MA**] [**MasterPel 210D**] or comparable product by one of the following:

<**Insert manufacturer's name**>.

* + - * 1. Water: Potable.
			1. REINFORCEMENT

Retain "Uncoated-Steel Reinforcing Bars" Paragraph below for reinforcing bars in grouted cells. Revise if another grade of steel is required. Revise to specify epoxy-coated, stainless steel, or galvanized bars if required.

* + - * 1. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).
				2. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Dur-O-Wal; a Hohmann & Barnard company.

Heckmann Building Products, Inc.

Hohmann & Barnard, Inc.

Lock Rite.

Wire-Bond.

<**Insert manufacturer's name**>.

Standard in "Masonry-Joint Reinforcement, General" Paragraph below includes requirements for mill-galvanized carbon steel, hot-dip galvanized carbon steel, and stainless steel. Specifying these materials separately in unnecessary.

* + - * 1. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951/A951M.

Mill-galvanized coating is not as thick as hot-dip galvanized coating. In accordance with ASTM A951/A951M, mill-galvanized coating may be applied to wire before fabricating, but hot-dip galvanized coating must be applied after fabricating.

Interior Walls: [**Mill-**] [**Hot-dip**] galvanized carbon steel.

Exterior Walls: [**Hot-dip galvanized carbon**] [**Stainless**] steel.

Wire Size for Side Rods: [**0.148-inch (3.77-mm)**] [**0.187-inch (4.76-mm)**] diameter.

Wire Size for Cross Rods: [**0.148-inch (3.77-mm)**] [**0.187-inch (4.76-mm)**] diameter.

Spacing of Cross Rods: Not more than 16 inches (407 mm) o.c.

Provide in lengths of not less than 10 feet (3 m) [**, with prefabricated corner and tee units**].

* + - 1. TIES AND ANCHORS
				1. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into masonry but with at least a 5/8-inch (16-mm) cover on outside face.
				2. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

Retain subparagraphs below only for those materials referenced in subsequent paragraphs.

"Mill-Galvanized, Carbon-Steel Wire" Subparagraph below is allowed only for anchors and ties in interior walls where humidity is less than 75 percent.

Mill-Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A641/A641M, Class 1 coating.

Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.

Retain first option in "Stainless Steel Wire" Subparagraph below unless higher corrosion resistance of Type 316 is required.

Stainless Steel Wire: ASTM A580/A580M, [**Type 304**] [**Type 316**].

"Galvanized-Steel Sheet" Subparagraph below is allowed only for anchors and ties in interior walls where humidity is less than 75 percent.

Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 (Z180) zinc coating.

Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.

Retain first option in "Stainless Steel Sheet" Subparagraph below unless higher corrosion resistance of Type 316 is required.

Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [**Type 304**] [**Type 316**].

Retain "Steel Plates, Shapes, and Bars" Subparagraph below if required for rigid anchors.

Steel Plates, Shapes, and Bars: ASTM A36/A36M.

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

If retaining last option in "Anchor Section for Welding to Steel Frame" Subparagraph below, note that TMS 402/602 does not allow ties made from mill-galvanized wire for interior use in spaces where humidity exceeds 75 percent.

Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, [**hot-dip galvanized steel**] [**stainless steel**] wire. [**Mill-galvanized wire may be used at interior walls unless otherwise indicated.**]

If retaining last option in "Tie Section" Subparagraph below, note that TMS 402/602 (formerly ACI 530) does not allow ties made from mill-galvanized wire for interior use in spaces where humidity exceeds 75 percent.

Tie Section: Triangular-shaped wire tie made from [**0.187-inch- (4.76-mm-)**] [**0.25-inch- (6.35-mm-)**] diameter, [**hot-dip galvanized steel**] [**stainless steel**] wire. [**Mill-galvanized wire may be used at interior walls unless otherwise indicated.**]

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

Retain "Connector Section" and "Tie Section" subparagraphs below; otherwise, retain "Corrugated-Metal Ties" Subparagraph below.

Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from [**0.060-inch- (1.52-mm-) thick steel sheet, galvanized after fabrication**] [**0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication**] [**0.062-inch- (1.59-mm-) thick, stainless steel sheet**] [**0.109-inch- (2.78-mm-) thick, stainless steel sheet**].

Note that TMS 402/602 does not allow ties made from galvanized-steel sheet for interior use in spaces where humidity exceeds 75 percent.

[**0.064-inch- (1.63-mm-)**] [**0.108-inch- (2.74-mm-)**] thick, galvanized-steel sheet may be used at interior walls unless otherwise indicated.

If retaining last option in "Tie Section" Subparagraph below, note that TMS 402/602 does not allow ties made from mill-galvanized wire for interior use in spaces where humidity exceeds 75 percent.

Tie Section: Triangular-shaped wire tie made from [**0.187-inch- (4.76-mm-)**] [**0.25-inch- (6.35-mm-)**] diameter, [**hot-dip galvanized steel**] [**stainless steel**] wire. [**Mill-galvanized wire may be used at interior walls unless otherwise indicated.**]

Corrugated-Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from [**0.060-inch- (1.52-mm-) thick steel sheet, galvanized after fabrication**] [**0.075-inch- (1.90 mm-)-thick steel sheet, galvanized after fabrication**] [**0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication**] [**0.062-inch- (1.59-mm-) thick, stainless steel sheet**] [**0.078-inch- (1.98-mm-) thick, stainless steel sheet**] [**0.109-inch- (2.78-mm-) thick, stainless steel sheet**] with dovetail tabs for inserting into dovetail slots in concrete.

[**0.064-inch- (1.63-mm-)**] [**0.079-inch- (2.01-mm-)**] [**0.108-inch- (2.74-mm-)**] thick, galvanized sheet may be used at interior walls unless otherwise indicated.

* + - * 1. Partition Top Anchors: 0.105-inch- (2.66-mm-) thick metal plate with a 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from [**steel, hot-dip galvanized after fabrication**] [**stainless steel**].

Rigid anchors can be used to connect T-intersections of CMU shear walls in lieu of masonry bonding or bond beams. They are also often used at T-intersections of other CMU walls, although masonry bonding and T-shaped masonry-joint reinforcement may be used.

* + - * 1. Rigid Anchors: Fabricate from steel bars [**1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated**] [**bent to configuration indicated**].

Retain one of three options in "Corrosion Protection" Subparagraph below. Rigid anchors may not be fully embedded in mortar or grout and therefore require a coating for corrosion protection. TMS 402/602 requires hot-dip galvanized or epoxy coating.

Corrosion Protection: [**Hot-dip galvanized to comply with ASTM A153/A153M**] [**Epoxy coating 0.02 inch (0.51 mm) thick**] [**Rust-inhibitive paint**].

* + - 1. EMBEDDED FLASHING MATERIALS

See the Evaluations for discussion of flashing materials before revising this article.

* + - * 1. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

Insert terne-coated stainless steel or lead-coated copper if required.

Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch (0.40 mm) thick.

Copper: ASTM B370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. (4.9-kg/sq. m) weight or 0.0216-inch (0.55 mm) thick or ASTM B370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. (3.7-kg/sq. m) weight or 0.0162 inch (0.41 mm) thick.

Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.

Delete first subparagraph below if plain (flat) sheet metal flashing is acceptable. Revise if dovetail pattern is required for interlocking bond.

Fabricate through-wall metal flashing embedded in masonry from [**stainless steel**] [**copper**], with ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Cheney Flashing Company.

Hohmann & Barnard, Inc.

Keystone Flashing Company, Inc.

Sandell Manufacturing Co., Inc.

<**Insert manufacturer's name**>.

Delete first subparagraph below if not required.

Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.

Usually retain one or both of first two subparagraphs below if metal through-wall flashing is used. See the Evaluations.

Fabricate through-wall flashing with drip edge [**where**] [**unless otherwise**] indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees [**and hemmed**].

Fabricate through-wall flashing with sealant stop [**where**] [**unless otherwise**] indicated. Fabricate by bending metal back on itself 3/4 inch (19 mm) at exterior face of wall and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.

Retain first subparagraph below if either of last two subparagraphs above is used with ribbed metal flashing.

Fabricate metal [**drip edges**] [**and**] [**sealant stops**] for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches (76 mm) into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam sheds water.

Retain one or both of first two subparagraphs below for use with flexible flashing if required. See the Evaluations.

Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees [**and hemmed**].

Fabricate metal sealant stops from stainless steel. Extend at least 3 inches (76 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.

Fabricate metal expansion-joint strips from [**stainless steel**] [**copper**] to shapes indicated.

Solder metal items at corners.

Delete "Flexible Flashing" Paragraph below if only metal flashing is allowed. If concealed metal flashing is required at certain locations, indicate those locations on Drawings or revise paragraph.

* + - * 1. Flexible Flashing: Use [**one of**] the following unless otherwise indicated:

"Copper-Laminated Flashing" Subparagraph below is an example only; revise if other laminated products are required.

Copper-Laminated Flashing: [**5-oz./sq. ft. (1.5-kg/sq. m)**] [**7-oz./sq. ft. (2-kg/sq. m)**] copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Advanced Building Products Inc.

Hohmann & Barnard, Inc.

Wire-Bond.

York Manufacturing, Inc.

<**Insert manufacturer's name**>.

Asphalt-Coated Copper Flashing: [**5-oz./sq. ft. (1.5-kg/sq. m)**] [**7-oz./sq. ft. (2-kg/sq. m)**] copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Advanced Building Products Inc.

Hohmann & Barnard, Inc.

Wire-Bond.

<**Insert manufacturer's name**>.

Some rubberized-asphalt flashing products are 0.040 inch (1.02 mm) thick; some are 0.030 inch (0.76 mm) thick; others are 0.025 inch (0.64 mm) thick. BIA recommends 0.030 inch (0.76 mm) as a minimum thickness.

Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than [**0.030 inch (0.76 mm)**] [**0.040 inch (1.02 mm)**].

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Advanced Building Products Inc.

Carlisle Coatings & Waterproofing Inc.

Fiberweb, Clark Hammerbeam Corp.

GCP Applied Technologies Inc. (formerly Grace Construction Products).

Heckmann Building Products, Inc.

Hohmann & Barnard, Inc.

Polyguard Products, Inc.

W. R. Meadows, Inc.

Williams Products, Inc.

Wire-Bond.

<**Insert manufacturer's name**>.

Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

Self-adhesive flashing using butyl rubber is more expensive than that made with rubberized asphalt and must not be used in contact with asphalt; however, it is more adhesive than rubberized asphalt at cold temperatures and does not soften and run as readily at high temperatures.

Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than [**0.030 inch (0.76 mm)**] [**0.040 inch (1.02 mm)**].

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

DuPont Building Innovations: E. I. du Pont de Nemours and Company.

Protecto Wrap Company.

Raven Industries, Inc.

Wire-Bond.

<**Insert manufacturer's name**>.

Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Hohmann & Barnard, Inc.

Hyload, Inc.

Mortar Net Solutions.

Wire-Bond.

<**Insert manufacturer's name**>.

Retain one or more of "Monolithic Sheet," "Self-Adhesive Sheet," and "Self-Adhesive Sheet with Drip Edge" subparagraphs below, or show on Drawings where each is required.

Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch (1.02 mm) thick.

Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch (0.64 mm) thick, with a 0.015-inch- (0.38-mm-) thick coating of adhesive.

"Self-Adhesive Sheet with Drip Edge" Subparagraph below is for applications where flashing extends to face of masonry. This material may be unsuitable for use at sealant joints, because it is difficult to remove the sealant for replacement without damaging the flashing.

Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch (0.64 mm) thick, with a 0.015-inch- (0.38-mm-) thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches (38 mm) from edge.

Color: [**Gray**] [**White**] [**Tan/buff**] [**Black**].

Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D4637/D4637M, 0.040 inch (1.02 mm) thick.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Carlisle Coatings & Waterproofing Inc.

Firestone Specialty Products.

Heckmann Building Products, Inc.

Hohmann & Barnard, Inc.

Sandell Manufacturing Co., Inc.

Wire-Bond.

<**Insert manufacturer's name**>.

* + - * 1. Application: Unless otherwise indicated, use the following:

Where flashing is indicated to receive counterflashing, use metal flashing.

Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.

Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing [**with a drip edge**] [**with a sealant stop**] [**or flexible flashing with a metal drip edge**] [**or elastomeric thermoplastic flashing with a drip edge**] [**or flexible flashing with a metal sealant stop**].

Where flashing is fully concealed, use [**metal flashing**] [**or**] [**flexible flashing**].

* + - * 1. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.

Manufacturers: Subject to compliance with requirements, provide products by the following:

Mortar Net Solutions.

<**Insert manufacturer's name**>.

* + - * 1. Solder and Sealants for Sheet Metal Flashings: [**As specified in Section 076200 "Sheet Metal Flashing and Trim."**]

Retain option in "Solder and Sealants for Sheet Metal Flashings" Paragraph above or one or more of "Solder for Stainless Steel," "Solder for Copper," and "Elastomeric Sealant" subparagraphs below. Grade Sn60 solder is 40 percent lead; Grade Sn96 is 0.10 percent lead; and Grade Sn50 is 50 percent lead.

Solder for Stainless Steel: ASTM B32, [**Grade Sn60**] [**Grade Sn96**], with acid flux of type recommended by stainless steel sheet manufacturer.

Solder for Copper: ASTM B32, [**Grade Sn50**] [**with maximum lead content of 0.2 percent**].

Revise "Elastomeric Sealant" Subparagraph below if sealant of specific type, grade, class, and use is required.

Elastomeric Sealant: ASTM C920, chemically curing [**urethane**] [**polysulfide**] [**silicone**] sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

* + - * 1. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
			1. MISCELLANEOUS MASONRY ACCESSORIES
				1. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from [**neoprene**] [**urethane**] [**or**] [**PVC**].
				2. Preformed Control-Joint Gaskets: Made from [**styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805**] [**or**] [**PVC, complying with ASTM D2287, Type PVC-65406**] and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
				3. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
			2. MASONRY-CELL FILL
				1. Loose-Fill Insulation: Perlite complying with ASTM C549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
				2. Lightweight-Aggregate Fill: ASTM C331/C331M.
			3. MORTAR AND GROUT MIXES
				1. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

Do not use calcium chloride in mortar or grout.

Retain one or more of first three subparagraphs below to indicate acceptable mortar types.

Use [**portland cement-lime**] [**masonry cement**] [**or**] [**mortar cement**] mortar unless otherwise indicated.

For exterior masonry, use [**portland cement-lime**] [**masonry cement**] [**or**] [**mortar cement**] mortar.

For reinforced masonry, use [**portland cement-lime**] [**masonry cement**] [**or**] [**mortar cement**] mortar.

Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

Preblended, dry mortar mix can help ensure uniformity, but is inappropriate for small projects.

* + - * 1. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
				2. Mortar for Unit Masonry: Comply with ASTM C270, [**Proportion**] [**Property**] Specification. Provide the following types of mortar for applications stated unless another type is indicated [**or needed to provide required compressive strength of masonry**].

Before retaining mortar types in subparagraphs below, see Appendix X1 in ASTM C270 and BIA Technical Notes 8A and 8B for recommendations; coordinate with requirements for masonry compressive strengths.

For masonry below grade or in contact with earth, use [**Type M**] [**Type S**].

For reinforced masonry, use [**Type S**] [**Type N**].

For mortar parge coats, use [**Type S**] [**or**] [**Type N**].

For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.

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

* + - * 1. Pigmented Mortar: Use colored cement product [**or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products**].

Retain first three subparagraphs below if retaining option in "Pigmented Mortar" Paragraph above. Percentages in first two subparagraphs are for pigments containing only metallic oxides. If pigments containing carbon black are used, carbon black must be limited to 2 percent of portland cement by weight or 1 percent of masonry cement or mortar cement.

Pigments shall not exceed 10 percent of portland cement by weight.

Pigments shall not exceed 5 percent of [**masonry cement**] [**or**] [**mortar cement**] by weight.

Insert materials and proportions used for sample in first subparagraph below if known.

Mix to match Architect's sample.

Application: Use pigmented mortar for exposed mortar joints with the following units:

Decorative CMUs.

Pre-faced CMUs.

Cast-stone trim units.

* + - * 1. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

Insert materials and proportions used for sample in first subparagraph below if known.

Mix to match Architect's sample.

Application: Use colored-aggregate mortar for exposed mortar joints with the following units:

Decorative CMUs.

Pre-faced CMUs.

Cast-stone trim units.

* + - * 1. Grout for Unit Masonry: Comply with ASTM C476.

Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 402/602 for dimensions of grout spaces and pour height.

Conventional Grout:

Proportion grout in accordance with ASTM C476, [**Table 1**] [**or**] [**paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa)**].

Provide grout with a slump of [**8 to 11 inches (200 to 280 mm)**] [**10 to 11 inches (250 to 280 mm)**] as measured in accordance with ASTM C143/C143M.

Obtain higher end of slump range using mid-range or high-range water-reducing admixtures.

Mid-Range or High-Range Water-Reducing Admixture:

Retain "Basis-of-Design Product" Subparagraph and list of manufacturers below to require a specific product or a comparable product from manufacturers listed.

Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; [**MasterPolyheed Series**] [**MasterGlenium Series**] or comparable product by one of the following:

<**Insert manufacturer's name**>.

Self-Consolidating Grout: Proportion grout in accordance with ASTM C476, for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa). Jobsite proportioning of self-consolidating grout is not permitted. Do not add water at jobsite except in accordance with self-consolidating grout manufacturer's instructions.

High-Range Water-Reducing Admixture:

Retain "Basis-of-Design Product" Subparagraph and list of manufacturers below to require a specific product or a comparable product from manufacturers listed.

Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; MasterGlenium Series or comparable product by one of the following:

<**Insert manufacturer's name**>.

Viscosity-Modifying Admixture:

Retain "Basis-of-Design Product" Subparagraph and list of manufacturers below to require a specific product or a comparable product from manufacturers listed.

Basis-of-Design Product: Subject to compliance with requirements, provide Master Builders Solutions; MasterMatrix VMA Series or comparable product by one of the following:

<**Insert manufacturer's name**>.

Slump Flow: 24 to 30 inches (600 to 750 mm) as determined in accordance with ASTM C1611/C1611M.

Visual Stability Index (VSI): Less than or equal to 1 as determined in accordance with ASTM C1611/C1611M, Appendix X.1.

* + - * 1. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

Application: Use epoxy pointing mortar for exposed mortar joints with pre-faced CMUs.

1. EXECUTION
	* + 1. EXAMINATION
				1. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

Verify that foundations are within tolerances specified.

Verify that reinforcing dowels are properly placed.

Verify that substrates are free of substances that would impair mortar bond.

* + - * 1. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			1. INSTALLATION, GENERAL
				1. Build chases and recesses to accommodate items specified in this and other Sections.
				2. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
				3. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
			2. TOLERANCES
				1. Dimensions and Locations of Elements:

For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).

For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).

For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

* + - * 1. Lines and Levels:

For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.

For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.

For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.

For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.

For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm).

* + - * 1. Joints:

For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).

For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).

For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).

For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

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

Pattern is usually running bond. If other bond patterns are required, specify in "Bond Pattern for Exposed Masonry" Paragraph below or indicate on Drawings.

* + - * 1. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in [**running bond**] [**bond pattern indicated on Drawings**]; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
				2. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than [**2 inches (50 mm)**] [**4 inches (100 mm)**]. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
				3. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
				4. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

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

* + - * 1. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
				2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
				3. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
				4. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

Retain one or more of first three subparagraphs below or revise to suit Project. Coordinate with firestopping requirements. Retain first subparagraph if live-load deflection of structure above will produce stress in masonry. Indicate on Drawings or insert descriptive requirements in this Section for building walls around steel joists and similar construction if required. Indicate joint-filler thickness on Drawings as well as details of connection required if structure acts as lateral support for partitions.

Install compressible filler in joint between top of partition and underside of structure above.

Spacing in first subparagraph below is an example only.

Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors [**48 inches (1200 mm)**] <**Insert spacing**> o.c. unless otherwise indicated.

Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 "Joint Firestopping."

* + - 1. MORTAR BEDDING AND JOINTING
				1. Lay hollow CMUs as follows:

Bed face shells in mortar and make head joints of depth equal to bed joints.

Bed webs in mortar in all courses of piers, columns, and pilasters.

Bed webs in mortar in grouted masonry, including starting course on footings.

Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

* + - * 1. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
				2. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.

Wet joint surfaces thoroughly before applying mortar.

Rake out mortar joints for pointing with sealant.

* + - * 1. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

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

* + - * 1. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
				2. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
				3. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.
			1. MASONRY-CELL FILL
				1. Pour [**loose-fill insulation**] [**lightweight-aggregate fill**] into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet (6 m).
				2. Install molded-polystyrene insulation units into masonry unit cells before laying units.
			2. MASONRY-JOINT REINFORCEMENT
				1. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

Revise three subparagraphs below if different spacing is required; delete if shown on Drawings.

Space reinforcement not more than 16 inches (406 mm) o.c.

Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.

Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings [**in addition to continuous reinforcement**].

* + - * 1. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

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

* + - * 1. Provide continuity at wall intersections by using prefabricated T-shaped units.
				2. Provide continuity at corners by using prefabricated L-shaped units.

Retain last paragraph above or option in paragraph below.

* + - * 1. Cut and bend reinforcing units as directed by manufacturer for continuity at [**corners,**] returns, offsets, column fireproofing, pipe enclosures, and other special conditions.
			1. ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE
				1. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

Provide an open space not less than [**1/2 inch (13 mm)**] [**1 inch (25 mm)**] [**2 inches (50 mm)**] wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.

Anchor masonry with anchors embedded in masonry joints and attached to structure.

Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

* + - 1. CONTROL AND EXPANSION JOINTS
				1. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

Show locations of joints on Drawings.

* + - * 1. Form control joints in concrete masonry [**as follows**] [**using one of the following methods**]:

Retain one or more of four subparagraphs below.

Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.

Install preformed control-joint gaskets designed to fit standard sash block.

Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.

Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

* + - 1. LINTELS
				1. Provide [**concrete**] [**or**] [**masonry**] lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

Delete paragraph below if bearing is shown on Drawings.

* + - * 1. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.
			1. FLASHING
				1. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.
				2. Install flashing as follows unless otherwise indicated:

Retain option in subparagraph below for manufactured flashing; delete if only metal flashing is used.

Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape [**as recommended by flashing manufacturer**].

At lintels, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.

Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.

Install metal [**drip edges**] [**and**] [**sealant stops**] with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.

Retain one of three subparagraphs below if flexible flashing materials are used. See the Evaluations.

Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.

Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

* + - * 1. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
				2. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
			1. REINFORCED UNIT MASONRY INSTALLATION

Usually retain "Temporary Formwork and Shores" Paragraph below only if reinforced masonry beams, slabs, soffits, and similarly formed elements are required.

* + - * 1. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

* + - * 1. Placing Reinforcement: Comply with requirements in TMS 402/602.
				2. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

Comply with requirements in TMS 402/602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

Retain subparagraph below unless high-lift grouting is allowed. See the Evaluations. TMS 402/602 limits grout lifts to 60 inches (1520 mm) unless masonry has cured for at least 4 hours, grout slump is between 10 and 11 inches (254 and 279 mm), and there are no intermediate bond beams between top and bottom of pour height.

Limit height of vertical grout pours to not more than [**60 inches (1520 mm)**] [**12.67 ft. (3.86 m)**] <**Insert height**>.

* + - 1. FIELD QUALITY CONTROL
				1. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

Level B special inspections are required for masonry in nonessential facilities designed by either analytical method and for essential facilities designed by empirical method; Level C for masonry in essential facilities (IBC Occupancy Category IV) designed by either analytical method.

* + - * 1. Inspections: Special inspections in accordance with Level [**B**] [**C**] in TMS 402/602 (formerly ACI 530).

Revise subparagraphs below to suit level of inspection required, based on occupancy category and design method.

Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

Place grout only after inspectors have verified proportions of site-prepared grout.

Retain "Testing Prior to Construction" Paragraph below for masonry in nonessential facilities designed by either analytical method and for essential facilities designed by empirical method.

* + - * 1. Testing Prior to Construction: One set of tests.

Testing frequency in "Testing Frequency" Paragraph below is requirement for masonry in essential facilities (IBC Occupancy Category IV) designed by either analytical method.

* + - * 1. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

Retain "Concrete Masonry Unit Test" Paragraph below if unit-strength method is used. Delete paragraph if retaining prism-test method.

* + - * 1. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140 for compressive strength.

TMS 402/602 requires verification of compliance of proportions for site-prepared mortar. Mortar aggregate ratio test in "Mortar Aggregate Ratio Test (Proportion Specification)" Paragraph below verifies ratio of aggregate to cementitious materials but does not indicate what cementitious materials are used. Observation of actual mortar mixing procedures as part of inspection program would provide better quality control.

* + - * 1. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.

"Mortar Test (Property Specification)" Paragraph below may be deleted if mortar is specified to comply with proportion specification or if retaining prism test. Testing for mortar air content is especially desirable for reinforced masonry. Testing for compressive strength is required if the property specification for mortar is used. Note that ASTM C780 states, "Strength values for mortars obtained through these testing procedures are not required, nor expected, to meet strength requirements of laboratory Specification C270 mortars."

* + - * 1. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for [**mortar air content**] [**and**] [**compressive strength**].

"Grout Test (Compressive Strength)" Paragraph below may be deleted if grout is specified by proportions stated in ASTM C476 rather than by compressive strength or if retaining prism test.

* + - * 1. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

Usually retain appropriate test methods in "Concrete Masonry Unit Test," "Mortar Aggregate Ratio Test (Proportion Specification)," "Mortar Test (Property Specification)," and "Grout Test (Compressive Strength)" paragraphs above and delete "Prism Test" Paragraph below. Delete test methods above and retain below only if prism test is specified in "Performance Requirements" Article for determining compressive strength of masonry.

* + - * 1. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at [**7 days and at**] 28 days.
			1. PARGING
				1. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
				2. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.
				3. Damp-cure parging for at least 24 hours and protect parging until cured.
			2. REPAIRING, POINTING, AND CLEANING
				1. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
				2. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
				3. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
				4. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

Delete first two subparagraphs below if cleaners are not specified in Part 2 or if cleaners are not allowed.

Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.

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

Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

* + - 1. MASONRY WASTE DISPOSAL
				1. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

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

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

Crush masonry waste to less than 4 inches (100 mm) in each dimension.

Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 20 00 "Earth Moving."

Generally, retain subparagraph below. If required, increase limit if acid-soil plants are used for foundation plantings.

Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

* + - * 1. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
				2. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 22 00