SECTION 042300 - GLASS UNIT MASONRY

Revise this Section by deleting and inserting text to meet Project-specific requirements.

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:

Glass block set in mortar.

Glass block set in silicone sealant.

Glass block set in glass-block grid systems.

* + - * 1. Related Requirements:

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

Section 055000 "Metal Fabrications" for [**steel frames] [and] [loose steel lintels**] at glass unit masonry assemblies.

Section 085113 "Aluminum Windows" for aluminum windows installed within glass unit masonry assemblies.

* + - 1. SEQUENCING AND SCHEDULING

Retain this article if glass block is set with mortar and pointed with sealant.

* + - * 1. Sequence and coordinate completion of glass unit masonry assemblies so sealants can be installed immediately after mortar has attained final set.
      1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: For each type of product.
         5. Sustainable Design Submittals:
         6. Shop Drawings: Show fabrication and installation details for [**glass unit masonry, including vertical and horizontal coursing, anchors, reinforcement, and expansion strips] [and] [glass-block grid systems**].

Delete "Samples for Initial Selection" Paragraph below if colors and other characteristics are preselected and specified or scheduled.

* + - * 1. Samples for Initial Selection: [**Manufacturer's actual glass-block units] [glass-block grid material] [and] [joint materials involving color selection**].

Retain one of two "Samples for Verification" paragraphs below with or without "Samples for Initial Selection" Paragraph above.

* + - * 1. Samples for Verification: [**Glass-block units] [glass-block grid material] [and] [joint materials involving color selection**].
        2. Samples for Verification: Panels consisting of four full-size glass-block units with [**glass-block grid] [mortar] [and] [sealant**] joints.

Retain subparagraph below with either "Samples for Verification" Paragraph above if more than one form, pattern, or color is required.

Provide Samples for each form, pattern, and color of glass block and color of joint material[ **and glass-block grid material**] indicated or selected by Director’s Representative.

Retain below if Work of this Section is required to withstand specific design loads and design responsibilities have been delegated to Contractor, or if structural data are required as another way to verify compliance with performance requirements.

* + - * 1. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

Retain "Evaluation Reports" Paragraph below if glass-block grid systems are used.

* + - * 1. Evaluation Reports: For post-installed anchors, from ICC-ES.

Coordinate "Qualification Data" Paragraph below with qualification requirements in "Quality Assurance" Article.

* + - * 1. Qualification Data: For professional engineer .
      1. QUALITY ASSURANCE

Retain "Mockups" Paragraph below if required. If retaining, indicate location, size, and other details of mockups on Drawings or by inserts. Revise wording if only one mockup is required.

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

Retain one or more of three subparagraphs below. Revise if more mockups are needed because of variety of patterns, colors, and so forth. Revise size in first subparagraph below to suit size of units indicated or to suit Project.

Build mockup of typical [**exterior] [and] [interior**] panel, 48 by 48 inches in size.

If retaining first subparagraph below, show area of wall to be mocked up on Drawings.

Build mockup of typical [**exterior wall area] [and] [interior partition**] containing glass unit masonry assembly as shown on Drawings.

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 glass block in unopened cartons on elevated platforms, under cover, and in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
         2. Store glass-block grid materials in unopened cartons in an enclosed, dry location.
         3. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
         4. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
         5. Store accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
      2. FIELD CONDITIONS
         1. Environmental Limitations: Proceed with installation of glass unit masonry assemblies only when ambient and material temperatures are 40 deg F or higher.

Retain first subparagraph below for glass block installed with mortar.

Maintain temperature in installation areas at 40 deg F or above for 48 hours after installing.

Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or when joint substrates are wet.

1. PRODUCTS
   * + 1. MANUFACTURERS
          1. Source Limitations for Glass Block: Obtain[ **each type and pattern of**] glass block from single source from single manufacturer.
          2. Source Limitations for Accessory Materials: Obtain each cementitious material, admixture, and accessory component through single source from single manufacturer and each aggregate from single source or producer.
       2. PERFORMANCE REQUIREMENTS

Retain "Delegated Design" and "Structural Performance" paragraphs below if manufacturer designs glass-block grid systems.

* + - * 1. Delegated Design: Engage a qualified professional engineer Director’s Representative, licensed and registered to practice in the jurisdiction of the Project, to design glass-block grid systems, including attachment to building construction.
        2. Structural Performance: Glass-block grid systems, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

Retain "Loads" Subparagraph below if design loads are indicated on Drawings.

Loads: As indicated.

Retain one or more of three subparagraphs below, depending on application of glass-block grid system. Insert design loads required by local building code.

Wind Load: Uniform pressure of <**Insert wind-load pressure**>, acting inward or outward.

Floor Live Load: <**Insert load**>.

Roof Live Load: <**Insert load**>.

* + - 1. FIRE-RATED GLASS UNIT MASONRY

Several manufacturers offer units listed for fire-rated assemblies of up to 120 sq. ft. in area. Glass unit masonry assemblies are tested as windows, not as walls.

* + - * 1. Assemblies shall be listed by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 257.
      1. GLASS BLOCK

If more than one type of hollow glass block is used, copy and revise "Hollow Glass Block (GB-<#>)" Paragraph below for each type.

Insert number to complete drawing designation. Use these designations on Drawings to identify each product.

* + - * 1. Hollow Glass Block [**GB-<#>**]: Hollow units made from transparent glass, with manufacturer's standard edge coating.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

J. Weck GmbH & Co. KG; distributed by Glass Blocks Unlimited.

Mulia Inc.; Distributed by Glass Blocks Unlimited.

WGS Westerwald Glasstein GmbH Solaris Glasstein; distributed by Glass Blocks Unlimited.

Approved Equivalent.

Retain one of four options in "Glass Color" Subparagraph below. If more than one color is used, revise subparagraph to make terms plural where appropriate.

Glass Color: [**Colorless] [As indicated by manufacturer's designations] [Match Director’s Representative's samples] [As selected by Director’s Representative from manufacturer's full range**].

Retain one or more of eight "Pattern" subparagraphs below if patterns are not specified by referencing manufacturer's product designations using "Basis-of-Design Product" Subparagraph above.

First five "Pattern" subparagraphs below may be used to specify salient characteristics with "Basis-of-Design Product" Subparagraph above or may be used without naming manufacturers as generic specifications of patterns.

Pattern: Smooth, undistorted inner and outer faces.

Pattern: Wavy, light-diffusive design on inner faces, and smooth outer faces.

Pattern: Fluted, light-diffusive design, horizontal on one inner face, vertical on other, and smooth outer faces.

Pattern: Linear prismatic design, horizontal on one inner face, vertical on other, and smooth outer faces.

Pattern: Prismatic pyramid, light-diffusive design on inner faces, and smooth outer faces.

If retaining one of three "Pattern" subparagraphs below and more than one pattern is required, revise subparagraph retained to make terms plural where appropriate.

Retain first subparagraph below for proprietary specification if patterns are indicated on Drawings or in a schedule by manufacturer's trade names or catalog numbers.

Pattern: As indicated by manufacturer's designation.

Pattern: Manufacturer's standard decorative pattern to match Director’s Representative's sample.

Pattern: As selected by Director’s Representative from manufacturer's full range.

If third option in "Edge-Coating Color" Subparagraph below requires a custom color, manufacturer may impose limitations on production run and delivery of material. If retaining second option, insert manufacturer's name and color designation or indicate on Drawings or in a separate schedule.

Edge-Coating Color: [**White] [As indicated by manufacturer's designations] [Match Director’s Representative's sample] [As selected by Director’s Representative from manufacturer's full range**].

Retain either of first two subparagraphs below with any of last three options in "Edge-Coating Color" Subparagraph above.

Provide one color throughout for each pattern indicated.

Provide multiple colors as indicated for each size and pattern.

Sizes: Manufacturer's standard sizes corresponding to nominal sizes indicated on Drawings.

Retain "Sizes" Subparagraph above or one or more of 12 subparagraphs below. Retain or revise sizes to suit products retained.

Square-Block Size: [**5-3/4 inches] [7-3/4 inches**] square by 3-1/8 inches thick.

Square-Block Size: [**5-3/4 inches] [7-3/4 inches] [11-3/4 inches**] square by 3-7/8 inches thick.

Retain one of two "Square-Block Size" subparagraphs above for IP products with equivalent metric dimensions or one of first three "Square-Block Size" subparagraphs below for products manufactured to metric sizes.

Square-Block Size: [**4-1/2 inches] [7-1/2 inches] [9-13/16 inches] [11-13/16 inches**] square by 3-1/8 inches thick.

Square-Block Size: 7-1/2 inches square by 3-3/4 inches thick.

Square-Block Size: [**7-1/2 inches] [11-13/16 inches**] square by 3-15/16 inches thick.

Retain first "Rectangular-Block Size" Subparagraph below for IP products with equivalent metric dimensions, and retain second "Rectangular-Block Size" Subparagraph below for products manufactured to metric sizes.

Rectangular-Block Size: [**3-3/4 by 7-3/4 inches] [5-3/4 by 7-3/4 inches**] by [**3-1/8 inches] [3-7/8 inches**] thick.

Rectangular-Block Size: 4-1/2 by 9-13/16 inches by 3-1/8 inches thick.

Corner blocks in "Corner-Block Size and Shapes" Subparagraph below are available in limited patterns and sizes. Not all angles are offered by all manufacturers. Verify availability of selected patterns and sizes before retaining.

Corner-Block Sizes and Shapes: Manufacturer's standard units designed to form [**90] [45**] [**22.5**]-degree corners when joined with straight units of same height.

End blocks in "End-Block Size and Shape" Subparagraph below are available from some manufacturers in limited patterns. Verify availability of selected patterns and sizes before retaining.

End-Block Size and Shape: [**7-3/4 inches square] [3-3/4 by 7-3/4 inches]** by **[3-7/8 inches] [3-1/8 inches**] thick, actual size.

Top-corner blocks in "Top-Corner-Block Sizes and Shapes" Subparagraph below are available from some manufacturers in limited patterns. Verify availability of selected patterns before retaining.

Top-Corner-Block Sizes and Shapes: End unit with top matching finished end and with rounded finished corner in manufacturer's standard size to match end units.

Thick-faced block in "Thick-Faced Block" Subparagraph below are available in size 5-3/4 inches square from Pittsburgh Corning; in size 7-3/4 inches square from Pittsburgh Corning and Weck.

Thick-Faced Block: [**5-3/4 inches] [7-3/4 inches**] square by 3-7/8 inches thick, actual size, with faces at least 3/4 inch thick.

Metric size in "Thick-Faced Block" Subparagraph below is available from Solaris Glasstein.

Thick-Faced Block: 7-1/2 inches square by 3-1/8 inches thick, actual size, with faces at least 3/4 inch thick.

* + - * 1. Solid Glass Block [**GB-**<**#**>]: Colorless, transparent, solid glass blocks with [**smooth**] [**stippled**] faces and manufacturer's standard edge coating.

Square-Block Size: [**5-3/4 inches] [7-3/4 inches] [11-3/4 inches**] square by [**1-1/2 inches] [3 inches**] thick, actual size.

Rectangular-Block Size: [**3 by 7-3/4 inches] [5-3/4 by 7-3/4 inches**] by [**1-1/2 inches] [3 inches**] thick, actual size.

Retain one option for size in "Glass-Paver Block (GB-<#>)" Paragraph below. First option fits glass-block floor grid system. Insert other requirements, such as pattern designation, if applicable. Solid glass blocks in "Rectangular-Block Size" Paragraph above can also be used as pavers, and some companies make hollow glass blocks that they say are horizontal load bearing.

* + - * 1. Glass-Paver Block [**GB-<#>**]: Transparent, colorless, pressed glass units, with a smooth top surface and a decorative, light-diffusing, patterned bottom surface; [**6 inches square by 1 inch] [4-3/4 inches square by 1-9/16 inches] [6-5/16 inches square by 1-3/16 inches] [7-1/2 inches square by 1-15/16 inches] [7-1/2 inches square by 2-3/4 inches] [7-7/8 inches square by 7/8 inch] [7-7/8 inches square by 1-15/16 inches] [4-5/8 inches in diameter by 2-3/8 inches**] thick, actual size.
      1. GLASS-BLOCK GRID SYSTEMS

Descriptive requirements in this article are based on IBP's systems. Coordinate glass-block sizes in "Glass Block" Article with this article.

* + - * 1. General: Aluminum extrusions complying with ASTM B221, Alloy 6063-T6 or Alloy 6463-T6, forming a grid system and frame designed for application indicated.
        2. Window and Wall System: Aluminum T-bar grid with tubular frame and vinyl glass-block boots.

Retain one of two "Finish" subparagraphs below.

Finish: [**White] [Satin aluminum] [Bronze] [Taupe] [Gold] [Silver] [Black] [As selected by Director’s Representative from manufacturer's full range**].

Finish in "Finish" Subparagraph below is not standard but is available at extra cost.

Finish: Custom-color, polyester powder-coat finish; complying with AAMA 2604 and matching Director’s Representative's sample.

Glass-Block Size: 7-3/4 inches square by 3-1/8 inches thick.

Provide[ **self-flashing**] aluminum exterior frame covers with vinyl thermal break.

Retain last subparagraph above for exterior windows and first subparagraph below for shower enclosures.

Provide extruded-aluminum frame receivers (corner starters) at heads, jambs, and sills.

Retain first subparagraph below if applicable.

Provide extruded-aluminum mullions where indicated.

Usually retain subparagraph below.

Provide aluminum trim and closures as indicated.

* + - * 1. Skylight System: Aluminum T-bar grid with tubular frame; vinyl thermal break; extruded-aluminum, curb-mounting frame and counterflashing; and vinyl glass-block boots.

Retain one of two "Finish" subparagraphs below.

Finish: [**White] [Satin aluminum] [Bronze] [Taupe] [Gold] [Silver] [Black] [As selected by Director’s Representative from manufacturer's full range**].

Finish in "Finish" Subparagraph below is not standard but is available at extra cost.

Finish: Custom-color, polyester powder-coat finish; complying with AAMA 2604

Glass-Block Size: 7-3/4 inches square by 3-1/8 inches thick.

* + - * 1. Floor System: Aluminum T-bar grid and frame with glass-block boots made from UV- and oil-resistant EPDM.

Finish: Class II, clear-anodized finish complying with AAMA 611.

Coordinate size in "Glass-Paver-Block Size" Subparagraph below with size specified in "Glass-Paver Block" Paragraph in "Glass Block" Article.

Glass-Paver-Block Size: 6 inches square by 1 inch thick.

* + - * 1. Sealant: Product recommended by glass-block grid system manufacturer.
      1. MORTAR MATERIALS
         1. Portland Cement: ASTM C150, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.

Retain subparagraph below if joints are pointed.

Where joints are indicated to be raked out and pointed, gray cement may be used for setting mortar.

* + - * 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.

Retain "Masonry Cement" Paragraph below if required by UL listing for fire-rated assemblies.

* + - * 1. Masonry Cement: ASTM C91.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

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

Lafarge North America Inc.

Lehigh Hanson; HeidelbergCement Group.

Approved Equivalent.

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. Use only pigments with a record of satisfactory performance in masonry mortar.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Davis Colors.

Lanxess Corporation.

Solomon Colors, Inc.

Approved Equivalent.

Mixes in "Colored Cement Product" Paragraph below allow better control of color than job-mixed colored mortar.

* + - * 1. Colored Cement Product: Packaged blend made from portland cement and hydrated lime or masonry 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Essroc.

Lafarge North America Inc.

Lehigh Hanson; HeidelbergCement Group.

Approved Equivalent.

Colored Masonry Cement:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

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

Lafarge North America Inc.

Lehigh Hanson; HeidelbergCement Group.

Approved Equivalent.

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 by weight.

* + - * 1. Aggregate: ASTM C144, with 100 percent passing No. 8 sieve.

For [**pointing mortar] [and] [joints narrower than 1/4 inch**], use aggregate graded with 100 percent passing No. 16 sieve.

White Aggregates: Natural white sand or crushed white stone.

Retain "Colored Aggregates" Subparagraph below for colored-aggregate mortar.

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

Admixture in first "Water-Repellant Admixture" Paragraph below is recommended by Pittsburgh Corning. See the Evaluations for its use versus pointing joints with mortar or sealant.

* + - * 1. Water-Repellent Admixture: Dry mixture of stearates, water-reducing agents, and fine aggregates intended to reduce capillarity in mortar.

Admixture in "Water-Repellant Admixture" Paragraph below is made for mortar used with water-repellent-treated concrete masonry units.

* + - * 1. Water-Repellent Admixture: Liquid polymeric water-repellent mortar admixture that does not reduce flexural bond strength of mortar.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

ACM Chemistries.

BASF Corporation.

GCP Applied Technologies Inc.

Approved Equivalent.

* + - * 1. Water: Potable.
      1. GLASS UNIT MASONRY ACCESSORIES
         1. Panel Reinforcement: Ladder-type units, butt welded, not lapped and welded; complying with ASTM A951 in straight lengths of not less than 10 feet, and as follows:

Interior Walls: Hot-dip galvanized, carbon-steel wire.

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

Wire Size: W1.7 or 0.148-inch diameter.

Retain second option in "Width" Subparagraph below with 3-inch and 3-1/8-inch units according to manufacturer's written instructions.

Width: [**2 inches] [1-5/8 inches**].

Spacing of Cross Rods: Not more than 16 inches apart.

Revise "Panel Anchors" Paragraph below if stainless-steel panel anchors are required and availability is verified.

* + - * 1. Panel Anchors: Glass-block manufacturer's standard perforated steel strips, 0.0359 inch by 1-3/4 inches wide by 24 inches long, hot-dip galvanized after fabrication to comply with ASTM A153.
        2. Mortarless Installation System: System of [**aluminum] [or] [plastic**] perimeter framing, anchors, and spacers designed for installing glass block with sealant-filled joints.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Coleman Enterprises.

J. Weck GmbH.

Approved Equivalent.

* + - * 1. Fasteners, General: Unless otherwise indicated, provide Type 304 or Type 316 stainless-steel fasteners at exterior walls and zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 5, at interior walls. Select fasteners for type, grade, and class required.

Retain "Fasteners, General" Paragraph above for attaching panel anchors to steel members; retain "Post-Installed Anchors" Paragraph below for attaching to masonry and concrete. Design Consultant to review code references and verify that the referenced sections/tables are current. Note that code references shall be based on the current version of the Uniform Code.

* + - * 1. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193[ **or AC308**].

Insert other anchors as required.

* + - * 1. Asphalt Emulsion: Cold-applied asphalt emulsion complying with ASTM D1187 or ASTM D1227.

Expansion strips in "Mineral-Fiber Expansion Strips" Paragraph below are required by some glass-block manufacturers' listings for fire-rated assemblies. Note that the term "mineral fiber" includes products made from glass fibers.

* + - * 1. Mineral-Fiber Expansion Strips: Comply with requirements of fire-rated assembly listing and glass-block manufacturer.

Use for fire-rated assemblies.

Retain "Mineral-Fiber Expansion Strips" Paragraph above if required for fire-rated installations. Pittsburgh Corning's UL listing allows use of plastic foam described in "Plastic-Foam Expansion Strips" Paragraph below.

* + - * 1. Plastic-Foam Expansion Strips: Polyethylene foam complying with requirements of glass-block manufacturer; 3/8 inch thick by [**4 inches] [3-1/2 inches] [2-1/2 inches**] wide.

Retain subparagraph below and "Mineral-Fiber Expansion Strips" Paragraph above if fire-rated assemblies are required. Retain option in subparagraph below if mineral-fiber expansion strips are not required for fire-rated assemblies.

Use plastic-foam expansion strips for[ **fire-rated and**] non-fire-rated assemblies.

* + - * 1. Sealants: Manufacturer's standard elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants."

Retain one or more sealant types in first three subparagraphs below; if retaining more than one type, indicate applications of each, such as "exterior joints," "interior joints," "sealant for pointing joints," "perimeter joints," and so forth. Coordinate below with "Joint-Sealant Schedule" Article in Section 079200 "Joint Sealants." Retain designations such as "JS-#" if they are retained in "Joint Sealants" Section.

[<JS-#>]: [**Silicone, nonstaining, S, NS, 50, NT] <Insert joint sealant**>.

[<JS-#>]: [**Urethane, S, NS, 25, NT] <Insert joint sealant**>.

[<JS-#>]: [**Acrylic latex] <Insert joint sealant**>.

* + - * 1. Sealant Accessories: Provide sealant accessories, including primers, bond-breaker tape, and cylindrical sealant backing, that comply with applicable requirements in Section 079200 "Joint Sealants."
      1. MORTAR MIXES
         1. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, or antifreeze compounds unless otherwise indicated.

Do not use calcium chloride in mortar.

For mortar in exterior panels, use water-repellent admixture according to admixture manufacturer's written instructions.

Retain last subparagraph above or first subparagraph below if required. Retain above if no pointing is required. Retain below if pointing is required and mortar is used for pointing. Delete both if no exterior panels or joints are pointed with sealant.

For pointing mortar in exterior panels, use water-repellent admixture according to admixture manufacturer's written instructions.

Retain subparagraph below if masonry cement is unacceptable.

Limit cementitious materials in mortar to portland cement and lime.

Retain one of two "Mortar for Glass Unit Masonry Assemblies" paragraphs below. Mortar mixes in UL listings vary by manufacturer.

* + - * 1. Mortar for Glass Unit Masonry Assemblies: Provide mortar, mixed according to glass-block manufacturer's listing with testing and inspecting agency, for fire-resistance rating indicated.
        2. Mortar for Glass Unit Masonry Assemblies: Comply with ASTM C270, Proportion Specification for Type S mortar.

Retain subparagraph below with one of two "Mortar for Glass Unit Masonry Assemblies" paragraphs above.

Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Mix mortar to produce a stiff but workable consistency that is drier than mortar for brick or concrete masonry. Discard mortar when it has reached initial set.

Retain "Pigmented Mortar" or "Colored-Aggregate Mortar" Paragraph below unless joints are pointed with sealant.

* + - * 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 three subparagraphs below if retaining option in "Pigmented Mortar" Paragraph above. Percentages in first two subparagraphs below 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.

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

Pigments shall not exceed 5 percent of masonry cement by weight.

Mix to match Director’s Representative's sample.

Insert, in "Colored-Aggregate Mortar" Paragraph below, materials and proportions used for sample if known.

* + - * 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.

Mix to match Director’s Representative's sample.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine sills, jambs, and heads surrounding glass unit masonry assemblies, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
          2. Proceed with installation only after unsatisfactory conditions have been corrected.
       2. INSTALLING GLASS BLOCK WITH MORTAR

Preparation in first paragraph below provides bond break at sill and expansion joints at head and jambs, and isolates glass unit masonry assembly from rest of wall.

* + - * 1. Apply a heavy coat of asphalt emulsion to sill and adhere expansion strips to jambs and heads with asphalt emulsion. Allow asphalt emulsion to dry before placing mortar. Trim expansion strips to width required to fit glass block and to full lengths of heads and jambs.

Joint widths in remaining paragraphs below are examples only. Generally, joint width should be twice the diameter of panel reinforcement. Spacers are available to help control joint thickness.

* + - * 1. Set glass block with completely filled bed and head joints, with no furrowing, accurately spaced and coordinated with other construction. Maintain [**1/4-inch] [3/8-inch**] exposed joint widths unless otherwise indicated.
        2. Install panel reinforcement in horizontal joints at spacing indicated and continuously from end to end of panels; comply with the following requirements:

Spacings in "Vertical Spacing of Panel Reinforcement for Exterior Panels" and "Vertical Spacing of Panel Reinforcement for Interior Panels" subparagraphs below are examples only.

Vertical Spacing of Panel Reinforcement for Exterior Panels: [**Every other course but not more than 16 inches o.c., starting with first course above sill] [As indicated on Drawings**].

Vertical Spacing of Panel Reinforcement for Interior Panels: [**Not more than 16 inches o.c.] [As indicated on Drawings**].

Do not bridge expansion joints with panel reinforcement.

Place panel reinforcement in joints immediately above and below all openings within glass unit masonry assemblies.

Lap panel reinforcement not less than 6 inches if more than one length is necessary.

Embed panel reinforcement in mortar bed by placing lower half of mortar bed first, pressing panel reinforcement into place, and covering with upper half of mortar bed.

Retain first paragraph below if panel anchors are required. See the Evaluations.

* + - * 1. Install panel anchors at locations indicated and in same horizontal joints where panel reinforcement occurs. Extend panel anchors at least 12 inches into joints, and bend within expansion joints at edges of panels and across the head. Attach panel anchors as follows:

Revise or delete subparagraphs below to suit Project.

For in-place unit masonry assemblies and concrete, attach panel anchors with 1/4-inch- diameter, bolt-size post-installed anchors, two per panel anchor.

For new unit masonry assemblies, embed other ends of panel anchors, after bending portions crossing expansion joint, in horizontal mortar joints closest in elevation to joints in glass unit masonry assemblies containing panel anchors.

For steel members, attach panel anchors with 1/4-inch- diameter through bolts and nuts or bolts in tapped holes in steel members.

* + - * 1. Use rubber mallet to tap units into position. Do not use steel tools, and do not allow units to come into contact with metal accessories and frames.

Plastic spacers or wedges help keep joints uniform and keep mortar from being squeezed out of joints by weight of glass block above. When glass block is laid, mortar does not stiffen immediately after being placed, because glass blocks do not absorb water from mortar as other masonry units do.

* + - * 1. Use [**plastic spacers] [or] [temporary wedges**] in mortar joints to produce uniform joint widths and to prevent mortar from being squeezed out of joints.

Retain subparagraph below if joints are not pointed.

If temporary wedges are used, remove them after mortar has set and fill voids with mortar.

* + - * 1. Keep expansion joints free of mortar.

Retain first paragraph below if pointing is required. See the Evaluations.

* + - * 1. Rake out joints indicated to be pointed to a uniform depth sufficient to accommodate pointing material, but not less than joint width.

If temporary wedges are used, remove them before raking out and pointing joints.

Point joints at [**exterior face] [both faces**] of exterior panels with mortar.

For pointing with mortar, retain one of two options in last subparagraph above. For pointing with sealant, retain one of two options in first subparagraph below or retain second subparagraph below.

Point joints at [**exterior face] [both faces**] of exterior panels with sealant.

Point joints at both faces of exterior and interior panels with sealant.

* + - * 1. Point joints with mortar by filling raked joints and voids. Place and compact pointing mortar in layers not more than 3/8 inch thick. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

Tool exposed joints slightly concave when pointing mortar is thumbprint hard. Use a smooth plastic jointer larger than joint width.

Delete last paragraph above and retain first paragraph below if joints are pointed with sealant. See the Evaluations for sealant considerations.

* + - * 1. Point joints by filling with sealant to comply with requirements in Section 079200 "Joint Sealants."
        2. Clean glass unit masonry assemblies as work progresses. Remove mortar fins and smears immediately, using a clean, wet sponge or a scrub brush with stiff fiber bristles. Do not use harsh cleaners, acids, abrasives, steel wool, or wire brushes when removing mortar or cleaning glass unit masonry assemblies.
        3. Install sealant at jambs, heads, mullions, and other locations indicated. Prepare joints, including installation of primer and bond-breaker tape or cylindrical sealant backing, and apply elastomeric sealants to comply with requirements in Section 079200 "Joint Sealants."
        4. Construction Tolerances: Set glass block to comply with the following tolerances:

First option in "Variation from Plumb" Subparagraph below is from BIA's "Guide Specifications for Brick Masonry." Second option below is for tighter tolerances, which can be attained with careful work, because glass block varies less in size than brick. Retain or revise to suit Project.

Variation from Plumb: For vertical lines and surfaces, do not exceed [**1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet] [1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch in 40 feet**] or more.

Variation from Level: For bed joints and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.

Variation of Location in Plan: For location of elements in plan, do not vary from that indicated by more than plus or minus 1/4 inch.

Tolerance in "Variation in Mortar-Joint Thickness" Subparagraph below is only half of BIA's; it can easily be attained, because glass block varies less in size than brick.

Variation in Mortar-Joint Thickness: Do not vary from joint thickness indicated by more than plus or minus 1/16 inch.

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

* + - 1. INSTALLING GLASS BLOCK WITH SEALANT
         1. General: Install mortarless glass-block systems according to manufacturer's written instructions.

Fasten frames and anchors or clips securely to surrounding construction.

Shim starting track as needed to make it level.

Adhere glass block to starting track and spacers with silicone sealant.

* + - * 1. After glass blocks are installed, apply sealant to completely fill channel around each glass block, and tool flush with exterior surface. Remove excess sealant and smears.
      1. GLASS-BLOCK GRID SYSTEM INSTALLATION
         1. General: Install glass-block grid systems according to manufacturer's written instructions.
         2. Window and Wall System Installation: Assemble grid system, apply continuous sealant bead to back of window Z-bar, place in position, adjust as needed to make grid level and plumb, and fasten to substrate.

Insert glass blocks into vinyl glass-block boots and carefully insert into grid from exterior side. Install blocks firmly against T-bars without deforming boots.

Apply sealant to completely fill channel around each glass block, and tool flush with exterior surface. Remove excess sealant and smears.

* + - * 1. Skylight System Installation: Assemble grid system, apply continuous sealant bead to top of supporting curb, place in position, adjust as needed to bring grid true to line, and fasten to substrate.

Insert glass blocks into vinyl glass-block boots and carefully insert into grid from exterior side. Install blocks firmly against T-bars without deforming boots.

Apply sealant to completely fill channel around each glass block, and tool flush with exterior surface. Remove excess sealant and smears.

* + - * 1. Floor System Installation: Assemble grid system in position, adjusting supports as needed to level grid as system is assembled, and fasten to substrate.

Insert glass blocks into vinyl glass-block boots and install into grid. Install blocks flush with adjoining floor surfaces and aluminum grid.

Apply sealant to completely fill channel around each glass block and joints of aluminum grid. Tool flush with exterior surface and remove excess sealant and smears.

* + - 1. CLEANING
         1. On surfaces adjacent to glass unit masonry assemblies, remove mortar, sealants, and other residue resulting from glass-block installation, in a manner approved by manufacturers of materials involved.
         2. Remove excess sealants with commercial solvents according to sealant manufacturer's written instructions. Exercise care not to damage sealant in joints.
         3. Perform final cleaning of glass unit masonry assemblies when surface is not exposed to direct sunlight. Start at top of panel using generous amounts of clean water. Remove water with clean, dry, soft cloths; change cloths frequently[ **to eliminate dried mortar particles and aggregate**].

END OF SECTION 042300