Preparing Activity: USACE Superseding
UFGS-04 23 00 (November 2009)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SECTION 04 23 00

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11/15

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USACE / NAVFAC / AFCEC / NASA **UFGS-04 23 00 (November 2015)**

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SECTION 04 23 00

GLASS UNIT MASONRY
11/15

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NOTE: This guide specification covers the requirements for glass unit masonry work.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL

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NOTE: The following information should be shown on the project drawings:

1. Head, jamb, sill, and intermediate support construction details.

2. Clearances required for deflection and expansion.

Refer to manufacturer's data and TMS MSJC for glass unit panel size restrictions, limitations, and details. Refer to TMS MSJC for construction requirements for glass unit masonry.
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1.1 SUMMARY

This section includes glass masonry units, hollow or solid, including mortar, joint reinforcement, and other accessories for constructing glass unit masonry panels.t

1.2 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A580/A580M	(2023) Standard Specification for Stainless Steel Wire
ASTM A951/A951M	(2011) Standard Specification for Steel Wire for Masonry Joint Reinforcement
ASTM C270	(2019a; E 2019) Standard Specification for Mortar for Unit Masonry
ASTM C1384	(2012a) Standard Specification for Admixtures for Masonry Mortars
ASTM D1056	(2020) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1187/D1187M	(1997; R 2018) Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal

ASTM D1227	(2013; 2019) Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
ASTM D4819	(2013) Standard Specification for Flexible Cellular Materials Made From Polyolefin Plastics

THE MASONRY SOCIETY (TMS)

TMS MSJC	(2016) Masonry Standard Joint Committee's (MSJC) Book - Building Code Requirements and Specification for Masonry Structures, Containing TMS 402/ACI 530/ASCE 5, TMS 602/ACI 530.1/ASCE 6, and Companion Commentaries

UNDERWRITERS LABORATORIES (UL)

UL 9	(2009; Reprint Mar 2020) Standard for Fire Tests of Window Assemblies

1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Glass Masonry Units
Water Repellent Additive or Admixture
Joint Reinforcement
Perimeter Anchorage
Panel Anchors
Expansion Strip

SD-04 Samples

Glass Masonry Units
Joint Reinforcement
Perimeter Anchorage
Panel Anchors
Expansion Strip

SD-07 Certificates

Glass Masonry Units
Water Repellent Additive or Admixture
Mortar

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver cement, lime, and other cementitious materials to the site in unbroken containers, labeled with the manufacturers' names and brands. Store mortar materials in a manner to prevent the inclusion of foreign materials and damage by water or dampness. Avoid chipping, cracking and breakage of glass masonry units. Protect glass masonry units from contact with earth and exposure to the weather, and keep dry until used. Do not use materials containing frost or ice. Handle glass masonry units with care to avoid damage.

1.5 PROJECT/SITE CONDITIONS

Do not lay glass masonry units when the air temperature is 5 degrees C 40 degrees F and falling, or when it appears probable that temperatures below 5 degrees C 40 degrees F will be encountered before the mortar has set, unless protection is provided to prevent freezing. For protection, maintain the temperature of glass masonry units and mortar materials between 5 and 50 degrees C 40 and 160 degrees F. After erection, maintain air temperature above 5 degrees C 40 degrees F on both sides of glass masonry units for not less than 48 hours. Do not work with or on frozen materials. Cover the top of unfinished masonry work to protect it from the weather.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

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NOTE: The desired physical characteristics (Light transmittance, reflectivity, pattern, size, etc.) should be described. The most commonly used glass masonry unit is nominally 200 mm 8 inch by 200 mm 8 inch by 100 mm 4 inch thick. Other square sizes, nominally 150 mm 6 inch by 150 mm 6 inch and 300 mm 12 inch by 300 mm 12 inch, are available, as well as rectangular sizes including 100 mm 4 inch by 200 mm 8 inch and 150 mm 6 inch by 200 mm 8 inch. The three most commonly specified patterns are listed by name, but other patterns are available.

Thin hollow units, which are common to residential construction, are not listed because published physical properties of glass units are based on testing of standard hollow units and thin solid units.

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2.1.1 Glass Masonry Units

Provide glass masonry units of type[s], size, pattern and style specified. Do not change source of supply for material which will affect the appearance of the finished work after work has started. Keep on hand extra units amounting to [5] [_____] percent of the number of units incorporated in the work. Use extra units to replace units found to be defective. Provide units in which the surfaces intended to be in contact with mortar are treated with polyvinyl butyral edge coating or latex-based paint.

2.1.1.1 Standard Hollow Glass Masonry Units

Provide hollow glass lock units that are partially evacuated and have a minimum average glass face thickness of 5 mm 3/16 inches. Provide [DECORA] [VUE] [ARGUS] [_____] pattern [with LX] [without] fibrous glass insert, [_____] sized [197 by 197] [_____] by 98 mm [7-3/4 by 7-3/4] [_____] by 3-7/8 inches. Where units are designated as "reflective glass masonry unit", provide a highly reflective oxide surface coating of a [gray] [_____] color. Provide units with [75] [____] percent light transmission.

2.1.1.2 Thin Solid Glass Masonry Units

Provide clear [VISTABRIK] [_____] or Stippled pattern, 194 by 194 by 76 mm 7-5/8 by 7-5/8 by 3 inches. Provide units with [75] [____] percent light transmission.

2.1.1.3 Fire Rated Glass Masonry Units

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NOTE: Although walls are rated for fire resistance, windows (including glass unit masonry) are rated for fire protection. Although walls are tested for fire resistance, smoke resistance, and heat resistance, windows are only tested for fire and smoke

resistance (not heat). Glass unit masonry can be rated for 45 minutes (up to 3 m by 3.7 m 10 ft by 12 feet); 60 minutes (up to 9.3 m2 100 sf or 3 m 10 ft maximum); and 90 minutes (up to 9.3 m2 100 sf or 3 m 10 ft maximum).

NFPA 80 requires that fire rated glass block units be listed by UL and tested per UL 9.

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Where walls and partitions are indicated on the drawings to be fire rated and contain rated glass masonry unit window assemblies, use listed glass masonry units that have been fire tested in accordance with UL 9 to the indicated rating.

2.2 MORTAR

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NOTE: A water-repellent additive (included in the manufacture of the cement) or a water-repellent admixture (added by the contractor during mortar mixing) should be required when the glass unit masonry panel will be exposed to the exterior.

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2.2.1 Mortar

Comply with ASTM C270, Type S or N mortar, using white cementitious materials.

2.2.2 Water Repellent Additive or Admixture

Provide water repellent admixture, complying with ASTM C1384, in the mortar. Omit water repellent admixture if the cementitious materials include a water repellent additive..

2.2.3 Admixtures

Do not use admixtures unless approved by the Contracting Officer.

2.3 MORTAR MIXING

Mix cementitious materials and aggregate between 3 and 5 minutes in a mechanical batch mixer with a reduced amount of water to account for the lack of absorption of glass units. Hand mixing may be used only when specifically approved by the Contracting Officer.

2.4 ACCESSORIES

2.4.1 Joint Reinforcement

Comply with ASTM A951/A951M and, after fabrication, provide zinc coating by the hot-dip process conforming to ASTM A153/A153M, 458 g/m2 1.50 oz/ft2, or fabricate from wire complying with ASTM A580/A580M. Provide reinforcement with two parallel longitudinal wires of size[MW11 W1.7][3.4 mm 0.1483 inch] and butt-welded cross wires of size[MW11 W1.7][3.4 mm 0.1483 inch] at not greater than 406 mm 16 inches on center. Provide longitudinal wires spaced 50 mm 2 inches apart when used with standard hollow glass units and 41 mm 1-5/8 inches apart when used with thin solid

glass units. Provide joint reinforcement in flat sections, not less than 2.4 m 8 feet long, except that prefabricated corner reinforcements and other special shapes may be shorter.

2.4.2 Perimeter Anchorage

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NOTE: Glass unit masonry panels must be laterally supported at the top and sides by either panel anchors or channel restraints. The channel restraint may be designed as one piece or two pieces of angle stock. Channel-type restraints must be oversized to accommodate expansion material in the opening, and packing and sealant between the framing restraints and the glass unit masonry perimeter units. Lateral supports must be designed to resist applied loads or a minimum of 29919 N/m 200 lb/ft, per TMS MSJC

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2.4.2.1 Panel Anchors

Perforated steel strip not less than 0.9 mm 20 gauge, minimum of 44 mm wide by 610 mm long 1-3/4 inches wide by 24 inches long, punched with three staggered rows of elongated holes, and hot-dipped galvanized conforming to ASTM A153/A153M after fabrication; or perforated stainless steel strap not less than 0.8 mm 22 gauge, minimum of 44 mm wide by 610 mm long 1-3/4 inches wide by 24 inches long. Provide two fasteners per panel anchor, each capable of resisting a load of [_____] N pounds.

2.4.2.2 Channel-Type Anchorage

Clear anodized aluminum channels, 114 mm by 50 mm by 3 mm thick 4-1/2 inches by 2 inches by 1/8 inch thick for use with standard hollow glass units and 102 mm by 50 mm by 3 mm thick 4 inches by 1-1/2 inches by 1/8 inch thick or 95 mm by 50 mm by 3 mm thick 3-3/4 inches by 2 inches by 1/8 inch thick for use with thin solid glass masonry units. Provide channels with bituminous coating on surfaces that will contact dissimilar metals.

2.4.3 Expansion Strip

Strip of closed cell polyethylene foam conforming to ASTM D4819, Type II, or strip of sponge rubber conforming to ASTM D1056; 9 mm 3/8 inches thick.

2.4.4 Asphalt Emulsion

Asphalt emulsion conforming to ASTM D1187/D1187M, Type II for use on metal surfaces; and asphalt emulsion conforming to ASTM D1227, Type III, Class I for use on porous surfaces.

2.4.5 Sealant and Backer Rod

Comply with Section 07 92 00 JOINT SEALANTS.

PART 3 EXECUTION

3.1 PREPARATION

Before placing the mortar bed for the first course of glass masonry units,

apply a heavy coat of asphalt emulsion to sill surfaces and allow to thoroughly dry.

3.2 INSTALLATION

3.2.1 Tolerances

Erect glass unit masonry within site tolerances of TMS MSJC, Article 3.3 F.

3.2.2 Mortar Preparation

Keep mortar boxes, pans, and mixer drums clean and free of debris and dried mortar. Do not retemper mortar after initial set. Discard mortar that has not been placed in final position within 1-5 hours after initial mixing.

3.2.3 Mortar Joints

Construct mortar joints 6 mm 1/4 inch wide when laying standard hollow glass masonry units, and 10 mm 3/8 inch wide when laying thin solid glass masonry units. Fill head and bed joints completely and evenly and do not furrow the mortar. Remove loose and excess mortar. The practice of buttering at the corners of the unit and then throwing mortar or scrapings into the empty joints will not be permitted. Maintain joint tolerances in accordance with TMS MSJC.

In joints to be reinforced, place half the thickness of mortar, press in the reinforcing, then apply the second half of mortar on top so that the reinforcing is in the middle of the mortar joint. Place full mortar bed for joints not requiring reinforcing.

3.2.4 Glass Masonry Unit Installation

Do not use steel tools to tap glass units into position. Place rubber crutch tips at the ends of trowels to tap glass masonry units.

Lay glass masonry units [in stacked bond] [_____]. Do not realign, tap or otherwise move glass masonry units after initial placement.

3.2.5 Joint Reinforcement

Embed reinforcement in mortar bed joints at a maximum spacing of 400 mm centers 16 inch centers continuously from end to end of panel, except at expansion joints. Provide additional courses of joint reinforcement above and below openings within the glass masonry unit panel. Lap reinforcing not less than 150 mm 6 inches at splices where more than one length of reinforcement is used.

3.2.6 Lateral Support of Glass Masonry Unit Panels

3.2.6.1 General

Anchor walls and partitions to adjoining construction to provide lateral stability, but permit unrestricted deflection of construction above, using either channel type restraints or panel anchors.

3.2.6.2 Panel Anchors

Except where channel-type restraints are used, space panel anchors a

maximum of 400 mm 16 inches apart at jambs (in same joint as panel reinforcing), and 400 mm 16 inches apart at heads. Embed panel anchors in the mortar joints a minimum of 300 mm 12 inches, except where panel dimension is less than 600 Mm 2 feet. Provide a minimum embedment of 150 mm 6 inches when the panel dimension is less than 600 Mm 2 feet. Provide two fasteners per panel anchor.

3.2.7 Expansion Joints

Provide space indicated to permit expansion at heads and jambs of glass masonry unit panels. Maintain expansion joints at head, jambs and at intermediate supports free of mortar.

3.2.8 Mortar Joint Tooling

After initial set of mortar, tool exposed joints and compress with a rounded jointer. Provide finished surface of joint that is concave, smooth, and non-porous.

3.2.9 Sealing of Expansion Joints

After final set of mortar, remove mortar from expansion joints. Seal expansion joints at head, jamb and intermediate supports with sealant and backer rod specified in Section 07 92 00 JOINT SEALANTS, at least 24 hours after curing of the mortar.

3.3 ADJUSTING AND CLEANING

3.3.1 Repair of Defective Work

Upon completion of glass masonry unit erection, cut out defective mortar joints and tuck point joints solidly with mortar. Replace damaged glass masonry units by breaking out both faces of the unit and carefully removing the surrounding mortar and glass frames, making sure to avoid damage to adjacent units. Butter all edges of the replacement glass unit and place it in the opening. Using a tuckpointing trowel, push mortar through the joints from both sides of the panel, until joints are full, then tool when thumbprint hard.

3.3.2 Cleaning

Protect work that may be damaged, stained, or discolored by cleaning operations. Remove excess mortar from glass masonry units with damp cloth or sponge before set occurs. Clean exposed surfaces with clear water and stiff fiber brushes, and rinse with clear water. Where stains, mortar, or other soil remain, continue cleaning with warm water and soap. Do not use abrasive cleaners (steel wool, wire brush) or acids in conjunction with removing mortar or dirt from the glass masonry unit faces. Restore damaged, stained, or discolored work to original condition or provide new work.

-- End of Section --