Preparing Activity: NAVFAC Superseding
UFGS-08 81 00 (August 2011)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SECTION 08 81 00

GLAZING

05/19

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USACE / NAVFAC / AFCEC / NASA	**UFGS-08 81 00 (May 2019)**

Preparing Activity: NAVFAC	**Superseding**
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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023

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SECTION 08 81 00

GLAZING

05/19

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NOTE: This guide specification covers the requirements for normal glazing. For specifying pre-assembled window units used in residential buildings, utilize the following Sections: 08 51 13 ALUMINUM WINDOWS, 08 52 00 WOOD WINDOWS, or 08 53 00 PLASTIC WINDOWS.

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).

****

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NOTE: If special glazing such as leaded glass, laminated transparent mirrors, or plastic glazing for unprotected openings is required, add appropriate paragraphs.

****

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NOTE: To download UFGS Forms, Graphics, and Tables, go to: http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphics-tables

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NOTE: On the drawings, show:

1. Locations of each type of glass, using same terminology as in specification.

2. Thickness of glass, unless glass of each type is same thickness.

3. Frame and rabbet details, indicating method of glazing.

****

PART 1 GENERAL

1.1 REFERENCES

****

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.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 800	(2016) Voluntary Specifications and Test Methods for Sealants
AAMA GDSG-1	(1987) Glass Design for Sloped Glazing
AAMA TIR A7	(2011) Sloped Glazing Guidelines

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2021) Standard Specification for Elastomeric Cellular Preformed Gasket and

	Sealing Material
ASTM C864	(2005; R 2015) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1021	(2008; R 2014) Standard Practice for Laboratories Engaged in Testing of Building Sealants
ASTM C1036	(2021) Standard Specification for Flat Glass
ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
ASTM C1087	(2016) Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems
ASTM C1172	(2019) Standard Specification for Laminated Architectural Flat Glass
ASTM C1184	(2023) Standard Specification for Structural Silicone Sealants
ASTM C1281	(2016) Standard Specification for Preformed Tape Sealants for Glazing Applications
ASTM C1376	(2015) Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
ASTM D395	(2016; E 2017) Standard Test Methods for Rubber Property - Compression Set
ASTM D2287	(2019) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM D4802	(2016) Standard Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E119	(2022) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E413	(2022) Classification for Rating Sound

	Insulation
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM E2190	(2010) Standard Specification for Insulating Glass Unit Performance and Evaluation
ASTM E2226	(2015; R 2019b) Standard Practice for Application of Hose Stream
ASTM F1642/F1642M	(2017) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F2912	(2017) Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2008) Glazing Manual
GANA Sealant Manual	(2008) Sealant Manual
GANA Standards Manual	(2008) Engineering Standards Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-1200	(1983; R 2016) Guidelines for Insulating Glass Dimensional Tolerances
IGMA TB-3001	(2001) Guidelines for Sloped Glazing
IGMA TM-3000	(1990; R 2016) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2020) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2020) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2022) Standard for Fire Doors and Other Opening Protectives
NFPA 251	(2006) Standard Methods of Tests of Fire Resistance of Building Construction and Materials
NFPA 252	(2022) Standard Methods of Fire Tests of

	Door Assemblies
NFPA 257	(2022) Standard on Fire Test for Window and Glass Block Assemblies

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201	Safety Standard for Architectural Glazing Materials

UNDERWRITERS LABORATORIES (UL)

UL 752	(2005; Reprint Jan 2021) UL Standard for Safety Bullet-Resisting Equipment
UL MEAPD	(2011) Mechanical Equipment and Associated Products Directory (online version is listed under Certifications at www.ul.com)

1.2 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.
****

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:

****
NOTE: Regarding the use of SD-03 Product Data and SD-07 Certificates, only use one of these on complicated and large products. It is preferred to use SD-03 Product Data. If control tower glazing data is only available by certificates, use SD-07 Certificates.
****

SD-03 Product Data

Insulating Glass

Plastic Glazing

Glazing Accessories

Sealants

Joint Backer

SD-04 Samples

Insulating Glass

Plastic Sheet

Glazing Compound

Glazing Tape

Sealing Tapes

[SD-07 Certificates

Insulating Glass

Plastic Glazing

] SD-08 Manufacturer's Instructions

Setting and Sealing Materials

Glass Setting

SD-11 Closeout Submittals

Warranty for Insulated Glass Units

[Warranty for Polycarbonate Sheet

][Warranty for Monolithic Reflective Glass

][Warranty for Monolithic Opacified Spandrel

] **********
NOTE: The Energy Star designation below is for residential windows only.
****

[Energy Efficient Equipment for Residential Windows; S

][1.3 SYSTEM DESCRIPTION

Fabricate and install watertight and airtight glazing systems to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, or defects in the work. Glazed panels must comply with the safety standards, in accordance with ANSI Z97.1, and comply with indicated wind/snow loading in accordance with ASTM E1300.[Sloped glazing must comply with AAMA GDSG-1 and AAMA TIR A7, and IGMA TB-3001.]

[1.3.1 Glazing for Passive Solar and Dynamic Control Fenestration

****
NOTE: Use the following paragraph if design is utilizing Passive Solar Heating Systems or Chromogenic Fenestration.
****

Identify glazing for Passive Solar and Dynamic Control Fenestration noted as part of a passive solar heating system and/or chromogenic fenestration and evaluate separately from other fenestration. Glazing for use in Passive Solar systems are exempt from SHGC requirements. Area-weighted averaging of chromogenic fenestration with other non-chromogenic fenestration is not permitted. For chromogenic fenestration systems, the lower-rated labeled SHGC must be used with automatic controls to modulate the amount of heat flow into the space in multiple steps in response to daylight levels or solar intensity.

]]1.4 QUALITY CONTROL

Submit two 203 by 254 mm 8 by 10 inch samples of each of the following: tinted glass, patterned glass, heat-absorbing glass, [_____] and insulating glass units.

Submit three samples of each other material. Samples of plastic sheets must be minimum 125 by 175 mm 5 by 7 inches.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 4 degrees C 40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.7 WARRANTY

****
NOTE: The warranty clauses in this guide specification have been approved by a Level I Contracting Officer, and may be used without further approval or request for waiver.
****

****
NOTE: Delete inapplicable paragraph[s].
****

1.7.1 Warranty for Insulated Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

1.7.2 Warranty for Polycarbonate Sheet

For a 5-year period following acceptance of the work:

a. Warranty Type I, Class A (UV stabilized) sheets against breakage;

b. Warranty Type III (coated, mar-resistant) sheets against breakage and against coating delamination;

c. Warranty Type IV (coated sheet) against breakage and against yellowing;

d. Warranty extruded polycarbonate profile sheet against breakage.

For a 10-year period following acceptance of the work, warranty Type IV against yellowing and loss of light transmission.

[1.7.3 Monolithic Reflective Glass

Manufacturer must warrant the monolithic reflective glass to be free of peeling or deteriorating of coating for a period of 10 years after Date of Substantial Completion. Warranty must be signed by manufacturer.

][1.7.4 Monolithic Opacified Spandrel

Manufacturer must warrant the opacifier film on the spandrel to be free of peeling for a period of five years after Date of Substantial Completion.

Warranty must be signed by manufacturer.

]PART 2 PRODUCTS

****
NOTE: Specifically identify any openings that are intended to facilitate solar heat gain for space heating using "passive solar" design strategies. Note that such fenestration is exempt from the Solar Heat Gain Coefficient (SHGC) requirements below. Likewise, passive solar and chromogenic fenestration must be specified and evaluated separately from other fenestration. Area-weighted averaging of chromogenic fenestration with other non-chromogenic fenestration is not permitted.
****

2.1 PRODUCT SUSTAINABILITY CRITERIA

[2.1.1 Energy Efficient Equipment for Residential Windows

Provide Energy Star residential windows in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTINGparagraph ENERGY EFFICIENT PRODUCTS.

]2.2 GLASS

****
NOTE: Glazed openings subject to accidental human impact must be glazed with safety glazing material in accordance with Consumer Products Safety Commission (CPSC) Standard, 16 CFR Part 1201, Safety Standard for Architectural Glazing Materials. Consult applicable building codes for detail requirements.

Design must meet the requirements of UFC 1-200-02, "High Performance and Sustainable Building Requirements" which invokes the requirements within UFC 3-101-01, "Architecture". UFC 1-200-02 and UFC 3-101-01 make references throughout to various ASHRAE documents governing energy efficiency and requirements for the components of building envelope design including fenestrations and glazing.
****

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.2.1 Clear Glass

****
NOTE: Glass areas and thicknesses are based on 1.20 kilopascals 25 pounds per square foot (psf) design wind load and vertical glazing with annealed glass. For other glass and for wind loads greater than 1.20 kPa 25 psf, thickness will depend upon aspect ratio (length divided by width), area, and design wind load. The thickness and area limitations for each

type of glass must be indicated or specified. Do not specify glass less than 3.0 mm 1/8 inch.

Method of Determination for Minimum Glass Thickness:

Refer to UFC 4-010-01 "DoD Minimum Antiterrorism Standards for Buildings", ASTM E1300, ASTM F1642/F1642M and ASTM F2248.

1. Determine peak gust wind speed and corresponding design wind loads, considering location, height, shape, and orientation, in accordance with ASCE 7-16 "Minimum Design Loads for Buildings and Other Structures", latest edition.

2. Determine aspect ratio, area, and type of glass for each opening to be glazed.

3. Select thickness required from glass manufacturer's chart for each type of glass.

****

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NOTE: Use the following data on Army projects

a. Category I Products: Doors and glazed panels that contain single piece of glazing material no greater than 0.84 m2 9 ft2 in area. The product must be capable of withstanding 203 Nm 150 foot pound impact load test.

b. Category II Products: Doors and glazed panels that contain any single piece of glazing material greater than 0.84 m2 9 ft2 in area. The product must be capable of withstanding a 542 Nm 400-foot-pound impact load test. Category II products may be used in both Category I and Category II situations.

c. Doors: 16 CFR 1201 applies to all types of interior doors and exterior doors, including storm doors and combination doors. FIRE/SAFETY RATED GLASS: Is not required for openings in doors through which a 76 mm 3 inch diameter sphere is unable to pass. Glazing for fire doors must be in accordance with NFPA 80, even though this may be at variance with requirements of 16 CFR 1201.

d. Glazed Panels: 16 CFR 1201 no longer applies to exterior and interior glazed panels. FIRE/SAFETY RATED GLASS: Glazed panels must conform to ANSI Z97.1, SAFETY PERFORMANCE SPECIFICATION AND METHODS OF TEST FOR SAFETY GLAZING MATERIALS USED IN BUILDINGS. Since glazed panels may be hazardous, safety glazing should be generally provided as described below:

FIRE/SAFETY RATED GLASS

(1) Glazed panels of any size located adjacent to a doorway, with the nearest vertical edge of panel within 1219 mm (48 inches) of doorway, and with bottom edge of panel below top of door. Safety glazing is not required for panels separated from the doorway by an intervening interior permanent wall.

(2) Glazed panels with a surface area greater than 0.84 m2 9 ft2 where there is a walking surface on either side of panel, and the walking surface is within 914 mm 36 inches of the panel. Safety glazing is not required if the lowest edge of the glazing material is 457 mm 18 inches or more above both walking surfaces, or if the panels have a horizontal member, such as a mullion or permanent railing not less than 38 mm 1-1/2 inches in width, capable of withstanding a horizontal load of 75 kg/m (50 plf), on the accessible sides of the glazing and located between 609 mm and 914 mm 24 and 36 inches above the walking surface.

(3) Where insulating glass units are used in locations requiring safety glazing, both panes must be safety glass.

(4) For exterior applications, safety glazing must also meet the wind and snow load requirements in accordance with ASTM E1300.

(5) In general, any glazed area subject to human impact should be provided with safety glazing or other acceptable protective devices such as handrails or horizontal mullions.

ASTM C1036 covers the quality requirements for clear annealed glass, transparent tinted glass, patterned and wired glass with a series of classification designations such as Types, Classes, Qualities, Forms, Finishes, meshand pattern, as defined below:

1. Type designations are: Type I - Transparent Flat Glass; Class 1 - Clear, or Class 2 - Tinted; Type II - Patterned and Wired Flat Glass, Class 1 - Clear or Class 2 - Tinted..

2. Type I, Class 1 and 2 Quality and Uses: Quality: Q1, for the production of high quality mirrors; Q2, for the production of general use mirrors and other applications; Q3, production of architectural glass products, including coated, heat treated, laminated, and other select glass products; Q4, general glazing applications.

3. Type II, Class 1 and 2 Quality and Uses: Q5, applications in which design and aesthetic characteristics are major considerations; Q6, applications in which functional characteristics are a consideration and blemishes are not a major

concern.

4. Form designations are: Form 1 - Wired polished both sides; Form 2 - Patterned and wired, Form 3 - Patterned.

5. Finish Designations are: F1, patterned one side; F2, patterned both sides.

6. Mesh Designations: M1, Diamond; M2, Square; M3, Parallel Strand; M4, Special.

7. Pattern Designation: P1, Linear; P2, Geometric; P3, Random; P4, Special.

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NOTE: It is critical that skylights be maintainable. Designer must include skylight access devices as a part of the design package where skylights are large or at great heights above floor.

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NOTE: Use the following bracketed statement for Army projects only.

****

[For interior glazing (i.e., pass and observation windows), 6 mm 1/4 inch thick glass should be used.

] Type I, Class 1 (clear), Quality [q4 (A)] [q5 (B)]. Provide for glazing openings not indicated or specified otherwise. Use double-strength sheet glass or 3 mm 1/8 inch float glass for openings up to and including 1.39 square meters 15 square feet, 4.5 mm 3/16 inch for glazing openings over 1.39 square meters 15 square feet but not over 2.79 square meters 30 square feet, and 6 mm 1/4 inch for glazing openings over 2.79 square meters 30 square feet but not over 4.18 square meters 45 square feet.

2.2.2 Annealed Glass

****

NOTE: Annealed glass is used for general glazing where clear or tinted glass is required. Glass thickness must be shown on drawings. Under some heavy thermal conditions, tinted glass may require heat strengthening for thermal endurance.

****

Annealed glass must be Type I transparent flat type, [Class 1 - clear,] Quality q3 - glazing select, [_____] percent light transmittance, [_____] percent shading coefficient, conforming to ASTM C1036.

2.2.3 Heat-Absorbing Glass

****

NOTE: For Use On Army Projects Only: Heat-absorbing and light-absorbing glass may be used

in accordance with TI 800-01, DESIGN CRITERIA. Tinted (light-reducing) glass may be used where glare is a problem and a reduction of visible light transmission is desired. Visible light transmittance will vary from 15 to 85 percent, depending on color density and thickness. Color density is a function of thickness and increases as the thickness increases; visible light transmittance will decrease as thickness increases. ASTM C1036 separates Heat-Absorbing and Tinted (light-reducing) glasses into categories, Higher light transmittance, and Lower light transmittance, which is based on the maximum solar energy transmittance by glass thickness.

Refer to ASTM C1036 for evaluation quality requirements and glass manufacturer's data for color selection, light transmittance and shading coefficient. When specifying performance and color, the available ranges of performance and colors should be specified for glazing units to allow several manufacturers to bid. When matching existing glass, provide existing manufacturer's name, color and acceptable range for shading factor, light transmittance, indoor and outdoor reflectance.

Heat-absorbing and light-reducing glass is affected by thermal stresses which can result in breakage. Care should be taken to make sure that the glass units will not be thermally overburdened. Glass that will be thermally overburdened should be Heat-Strengthened or, if safety glazing is required, Fully Tempered to resist thermal breakage. Refer to ASTM C1048 for quality evaluation and refer to manufacturer's data for performance and color selection.

Factors which increase the risk of breakage include building orientation, unusual shapes of lites, large lites, indoor shading devices, heating registers, and outdoor shading by trees, structure or exterior shading devices.

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****

NOTE: For Navy Projects, consult manufacturer's literature for colors, thicknesses, and transmittance values available. Coordinate with safety glazing requirements and paragraph TEMPERED GLASS.

****

Type I, Class 2 (tinted), Quality [q3 (select)] [q4 (A)], [_____] mm inch thick, [blue][green] in color, [_____] percent light transmittance, [_____] percent shading coefficient, conforming to ASTM C1036.

2.2.4 Reflective Coating Vision Glass

ASTM C1376

2.2.5 Wired Glass

****

NOTE: Wired glass is no longer produced in the United States. On 17 March 1992 (effective for a five year period) OSD determined that the Buy America Act does not apply to the procurement of wired glass and added the product to the list of excepted materials under 48 CFR 25.108(d)(1) Excepted Articles, Materials, and Supplies. Accordingly, wired glass furnished in compliance with Section 08 81 00 GLAZING does not violate the Buy America Act.

Types of wired glass available are polished, patterned, and tinted/heat-absorbing wired glass. Wired glass cannot be tempered. Wired Glass does not meet the requirements of 16 CFR 1201 and cannot be used as safety glazing materials in situations governed by that regulation.

Typically 6 mm 1/4 inch thick wired glass is used for fire-rated windows and doors where required by building codes and other fire-protection criteria.

Only wired glass in Mesh 1 - Diamond and Mesh 2 - Square are acceptable for fire rated door and window openings. Mesh 3 - Parallel is not acceptable for fire rated openings.

Wired glass, because of the wire mesh and edge damage from cutting, is very susceptible to thermal breakage. Heat absorbing wired glass increases the tendency for breakage. Wired glass is also susceptible to edge breakage from water penetrating the capillary in which the wires reside. The glazing system should insure that the edges are kept dry by sealing the edges with silicone.

****

Provide UL listed glass for fire-rated windows rated for [45] [20] minutes when tested in accordance with ASTM E2226. Wired glass must be Type II flat type, Class [1 - translucent] [2 - tinted, heat-absorbing] [3 - tinted, light-reducing], Quality [q7 - decorative] [q8 - glazing], Form [1 - wired and polished both sides] [2 - patterned and wired], [_____] percent light transmittance, [_____] percent shading coefficient, conforming to ASTM C1036. Wire mesh must be polished stainless steel Mesh [1 - diamond] [2 - square] [3 - parallel]. Wired glass for fire-rated windows must bear an identifying UL label or the label of a nationally recognized testing agency, and be rated for [20] [45] minutes when tested in accordance with NFPA 257. Wired glass for fire-rated doors must be tested as part of a door assembly in accordance with NFPA 252.

2.2.6 Patterned Glass

****

NOTE: Patterned glass is normally provided for windows of toilet rooms, vertical sliding sash in

post offices borrowed light sash at entrances, etc. Patterned glass is available in various thicknesses, with a pattern embossed on one or both sides. This glass is frequently called "figured", "obscure", or "decorative" glass. The degree of diffusion achieved is a function of the pattern and whether the pattern is on one or both sides. Some patterned glass cannot be heat-strengthened or tempered because of the pattern depth. Pattern glass does not offer complete obscurity and must be used with caution in very private areas such as toilets. The appropriate pattern designation should be selected from ASTM C1036. If a more specific pattern designation is desired, a manufacturer's name and pattern may be specified. When specific manufacturer's names and patterns are specified, the designer should add the following note to the spec: "Manufacturer's name and patterns indicated are for identification purposes only; the listing is not intended to limit selection of similar patterns from other manufacturers." Refer to GANA GLAZING MANUAL, and glass manufacturer's performance tables for proper evaluation of patterned glass thickness and size of opening to be glazed. Patterned glass 3 mm 1/8 inch thick should not be larger than 2.15 square meters 6 square feet.

****

Type II, Class 1 (translucent), Form 3 (patterned), Quality q5 or q6 (decorative), Finish [F1 (patterned one side)] [F2 (patterned two sides)], Pattern [P1 (linear)] [P2 (geometric)] [P3 (random)] [P4 (special)], [[_____] percent light transmittance, [_____] percent shading coefficient.] [3] [6] mm [1/8] [7/32] inch thick.[Provide [_____].]

2.2.7 Laminated Glass

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NOTE: For Antiterrorism (AT) criteria, refer to UFC 4-010-01 "DoD Minimum Antiterrorism Standards for Buildings." Laminated annealed flat glass must be provided at exterior window and door glazing. When force protection minimum measures are required, use the first bracketed option below. Use the second bracketed option when greater than minimum measures are required. This section must be completed for an established DBT and LOP by an engineer experienced in Blast-Resistant Design.

****

[ASTM C1172, Laminated glass fabricated from two nominal [3] [_____] mm [1/8] [_____] inch pieces of Type I, Class 1, [Class _____], Quality Q3, flat annealed [ultraclear]; [clear] [_____] glass conforming to ASTM C1036.] [ASTM C1172, Laminated glass fabricated from two nominal [3] [_____] mm [1/8] [_____] inch pieces of Type I, Kind [HS] [FT], Condition [A] [B] [C], Class 1, Class [_____], Quality Q3, flat [heat strengthened] [fully tempered] [clear] [_____] glass conforming to ASTM C1048.] Flat glass to be laminated together with a minimum of 0.75 mm 0.030 inch [_____] mm inch thick, clear [polyvinyl butyral] [ionoplast] [cast-in-place liquid resin] laminate, conforming to requirements of 16 CFR 1201 and ASTM C1172. The

total thickness of nominally 6 [_____] mm 1/4 [_____] inches. Color to be [clear] [gray] [bronze] [_____]. The total thickness of nominally [_____] mm inch.

[Design window glazing using a dynamic analysis[testing from airblast loading in accordance with ASTM F1642/F1642M by an independent testing agency regularly engaged in blast testing] to prove the glazing will provide performance equivalent to or better than a [low] [very low] [_____] hazard rating in accordance with ASTM F2912 for the peak positive pressure of [_____] kilopascals (kPa) [_____]pounds per square inch (psi) and peak positive phase impulse of [_____] kilopascal-millisecond (kPa-msec) pounds per square inch - millisecond (psi-msec).

]2.2.8 Bullet-Resisting Glass

****

NOTE: Bullet-resisting glazing material is available in ten rating levels to resist shots from the following Arms:

UL 752 Level 1: Provides protection against three shots of a 124-grain 9mm full metal copper jacket with lead core at an fps between 1175 and 1293

UL 752 Level 2: Provides protection against three shots of a 158-grain .357 magnum jacketed lead soft point at an fps between 1250 and 1375

UL 752 Level 3: Provides protection against three shots of a 240-grain 44 Magnum Lead Semi-Wadcutter Gas Checked at an fps between 1350 and 1485

UL 752 Level 4: Provides protection against one shot of a 180-grain .30 caliber rifle lead core soft point at an fps between 2540 and 2794

UL 752 Level 5: Provides protection against one shot of a 150-grain 7.62mm rifle lead core full metal copper jacket military ball (.308 caliber) at an fps between 2750 and 3025

UL 752 Level 6: Provides protection against five shots of a 124-grain 9mm full metal copper jacket with lead core at an fps between 1400 and 1540

UL 752 Level 7: Provides protection against five shots of a 55-grain 5.56mm rifle full metal copper jacket with lead core (.223 caliber) at an fps between 3080 and 3383

UL 752 Level 8: Provides protection against five shots of a 150-grain 7.62mm rifle lead core full metal copper jacket military ball (.308 caliber) at an fps between 2750 and 3025

Shotgun: Provides protection against three shots of a 12-gauge rifled lead slug at an fps between 1585 and 1744 and three shots of a 12-gauge 00 buckshot (12 pellets) at an fps between 1200 and 1320

****

Fabricated from Type I, Class 1, Quality q3 glass with polyvinyl butyral plastic interlayers between the layers of glass and listed by UL MEAPD as bullet resisting, with a rating Level of [Level 1] [Level 2] [Level 3] [Level 4] [Level 5] [_____] in accordance with UL 752. Provide [_____] [where indicated].

[2.2.9 Mirrors

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NOTE: For Army projects only. Navy projects will specify mirrors in Division 10, Specialties. Select the frames (J-Mold channels) or clips to secure mirror to wall. Mastic is required with each type of installation. Mirror sizes will be shown on the drawings. Coordinate with Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS, Section 05 51 00 METAL STAIRS or Section 05 51 33 METAL LADDERS and Section 10 28 13 TOILET ACCESSORIES to ensure that frames are specified for these mirrors.

One-way vision glass should be used for psychiatric and security observation windows. Where safety glazing is required, specify either laminated glass or tempered glass.

****

2.2.9.1 Glass Mirrors

Glass for mirrors must be Type I transparent flat type, Class 1-clear, Glazing Quality q1 6 mm 1/4 inch thick conforming to ASTM C1036. Glass must be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating must be highly adhesive pure silver coating of a thickness which must provide reflectivity of 83 percent or more of incident light when viewed through 6 mm 1/4 inch thick glass, and must be free of pinholes or other defects. Copper protective coating must be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and must be of proper thickness to prevent "adhesion pull" by mirror backing paint. Mirror backing paint must consist of two coats of special scratch and abrasion-resistant paint , and must be baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

]2.2.10 One-Way Vision Glass (Transparent Mirrors)

Type I, Class 1, Quality q1, 6 mm 1/4 inch thick, coated on one face with a hard, adherent film of chromium or other approved coating of equal durability. Glass must transmit not less than 5 percent or more than 11 percent of total incident visible light and must reflect from the front surface of the coating not less than 45 percent of the total incident visible light.[Provide [_____].]

2.2.11 Tempered Glass

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NOTE: Tempered glass is the preferred material for areas requiring safety glazing materials. Laminated glass, organic-coated glass, wire glass, and plastic

sheet are permitted if they conform to the requirements of the CPSC 16 CFR Part 1201.
****

ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class [1 (transparent)] [2 (tinted heat absorbing)], Quality q3, [_____] mm inch thick, [_____] percent light transmittance, [_____] percent shading coefficient conforming to ASTM C1048 and GANA Standards Manual. Color must be [[clear] [bronze] [gray] [_____]]. [Provide [_____]] [and wherever safety glazing material is indicated or specified].

2.2.12 Heat-Strengthened Glass

ASTM C1048, Kind HS (heat strengthened), Condition A (uncoated), Type I, Class [1 (clear)] [2 (tinted heat absorbing)], Quality q3, [_____] mm inch thick. [Provide [_____].]

2.2.13 Spandrel Glass

2.2.13.1 Ceramic-Opacified Spandrel Glass

Ceramic-opacified spandrel glass must be Kind HS heat-strengthened transparent flat type, Condition B, coated with a colored ceramic material on No. 2 surface, Quality q3 - glazing select, [_____] mm [_____] inch thick, conforming to ASTM C1048. Glass performance must be K-Value/Winter Nighttime [_____], R-Value/Winter Nighttime [_____], shading coefficient [_____]. Color must be [_____].

2.2.13.2 Film-Opacified Spandrel Glass

Film-opacified spandrel glass must be Kind HS heat-strengthened transparent flat type, Quality q3 - glazing select, Condition C glass with a polyester or polyethylene film 0.025 mm to 0.127 mm 2 mils to 5 mils thick attached to No. 2 surface of a sputtered solar-reflective film, conforming to ASTM C1048. Film opacification must be compatible to and specifically developed for application to solar reflective films. Glass performance must be K-Value/Winter Nighttime [_____], R-Value/Winter Nighttime [_____], shading coefficient [_____]. Color must be [_____].

2.2.13.3 Spandrel Glass With Adhered Backing

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NOTE: Spandrel glass with adhered backing is required wherever glass spandrels are located above sidewalks, pedestrian or vehicular ramps, paved plazas, entrances not covered by a protective canopy, and other locations where glass could fall onto an area used by the public.
****

ASTM C1048, Kind HS or FT, Condition B (ceramic coated), Type I, Quality q5, [_____] mm inch thick and must pass the fallout resistance test specified in ASTM C1048. [Provide [_____].]

[2.2.14 Fire/Safety Rated Glass

****
NOTE: Refer to NFPA 101 Life Safety Code for fire rated requirements of assemblies which have glazing

components. Coordinate with adjacent framing and hardware assemblies to achieve required rating.
****

[2.2.14.1 Fire Protection Rated Glass

Clear tempered and meet 16 CFR 1201 Category I (under 0.836 sqm) (under 9 square feet) or II (over 0.836 sqm) (over 9 square feet) impact safety standard. Glass to make [20] [45] minute rating when tested in accordance with NFPA 257 and NFPA 252. Glass to be permanently labeled with appropriate markings.

][2.2.14.2 Fire Resistive Rated Glazing

Fire resistive glass must be laminated, with intumescent interlayer, Type I transparent flat type, Class 1-clear and meet 16 CFR 1201 Category I (under 0.836 sqm) (under 9 square feet) or II (over 0.836 sqm) (over 9 square feet). Glass must have a [60] [90] [120] minute rating when tested in accordance with ASTM E119 and NFPA 251. Glass must be permanently labeled with appropriate markings.

]]2.3 INSULATING GLASS UNITS

****
NOTE: Where safety glazing is required, both lights of insulating units must be safety glass, and each light must have a permanent label.
****

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NOTE: When antiterrorism/force protection requirements apply, specify laminated annealed flat glass for interior light. Use the bracketed option regarding ASTM C1172 in the paragraph below.

NOTE: Where safety glazing is required, both lights of insulating units must be safety glass, and each light must have a permanent label.

NOTE: Design must meet the requirements of UFC 1-200-02, "High Performance and Sustainable Building Requirements" which invokes the requirements within UFC 3-101-01, "Architecture". UFC 1-200-02 and UFC 3-101-01 make references throughout to various ASHRAE documents governing energy efficiency and requirements for the components of building envelope design including fenestrations and glazing.

NOTE: U value (rate of heat transfer) and SHGC (how much heat the building gains from the sun) are determined on a whole-opening basis (glazing and frame). Specify U value and SHGC in the appropriate exterior opening (window, door, curtain wall) sections and coordinate insulated glass description with energy performance requirements specified in those sections. Include bracketed U value and SHGC requirements here only if not specified elsewhere as a whole-opening rating for frame and glass. Determine appropriate values by consulting ASHRAE

90.1 - SI ASHRAE 90.1 - IP.

Window properties are critical to energy performance and visual satisfaction. Low SHGC is achieved with selective glass, tinted glass, or reflective coating. Specify selective glass for clear appearance or when high visible transmittance is required for daylighting goals. In the Northern Hemisphere, south side glass may be protected from summer sun by an overhang and have a high SHGC if winter heat is useful. Specify a low SHGC for south-side glass if the building is dominated by internal heat gain and solar heat is unwelcome even in winter. North side receives very little sun and requires no special treatment.

Consider glazing with aerogel insulation between two panels of glass, producing the highest visual transmittance with the highest insulation values currently available. Verify availability and cost before specifying aerogel.

Installing energy efficient windows contributes to achieving sustainability requirements as outlined in UFC 1-200-02.

For specifying pre-assembled window units used in residential buildings, utilize the following Sections: 08 51 13 ALUMINUM WINDOWS, 08 52 00 WOOD WINDOWS, or 08 53 00 PLASTIC WINDOWS.

Designer must verify availability and adequate competition for products energy performance requirements before specifying and edit as needed.

NOTE: STC levels higher than 35 may require costly design modifications and special glazing. STC addresses construction subject to interior sound frequencies and does not include all typical outdoor frequencies; Outside-Inside Transmission Class (OITC) was developed to evaluate an expanded sound-frequency range generally considered to be more reflective of exterior noise conditions imposed on the building envelope such as road, rail, and airplane traffic.

****

[Two][Three] panes of glass separated by a dehydrated airspace[, filled with argon gas][, filled with krypton gas,][, filled with aerogel] and hermetically sealed, conforming to ASTM E2190. Submit performance and compliance documentation for each type of insulating glass.

[Insulated glass units must have a Solar Heat Gain Coefficient (SHGC) maximum of [_____] determined according to NFRC 200 and a U-factor maximum of [_____] W per square m by K Btu per square foot by hr by degree F in accordance with NFRC 100.

] [See section[s][_____] for energy performance requirements for glazed systems (glazing and frames).] [Glazed panels must be rated for not less

than [26] [30] [35] [_____] Sound Transmission Class (STC) when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.]

Dimensional tolerances must be as specified in IGMA TB-1200. Spacer must be black, roll-formed, [thin-gauge, C-section steel] [steel-reinforced butyl rubber] [thermally broken aluminum] [polyurethane and silicon foams], with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal must be compressed polyisobutylene and the secondary seal must be a specially formulated silicone.

****

NOTE: Delete intermediate light if triple glazing is not required.

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The inner light must be [ASTM C1172, clear annealed flat glass Type I, Class I, Quality q3] [ASTM C1036, Type I, Class 1, Quality q4, [_____] mm inch thick] [ASTM C1048, Grade B (fully tempered), Style I (uncoated), Type I, Class 1 (transparent), Quality q4, [_____] mm inch thick]. [The intermediate light must be [ASTM C1172, clear annealed flat glass Type I, Class I, Quality q3] [ASTM C1036, Type I, Class 1, Quality q4, [_____] mm inch thick] [ASTM C1048, Grade B (fully tempered), Style I (uncoated), Type I, Class 1 (transparent), Quality q4, [_____] mm inch thick].] The outer light must be [ASTM C1036, Type I, Class [1 (transparent)] [2 (tinted heat absorbing)], [2 (solar-reflective)], Quality q4, [_____] mm inch thick] [ASTM C1048, Grade B (fully tempered), Style I (uncoated), Type I, Class [1 (clear)] [2 (tinted heat absorbing)][solar-reflective], Quality q4, [_____] mm inch thick].

2.3.1 Low Emissivity Coatings

****

NOTE: Low emissivity coating should be on the air space surface of the inner pane of glass (the number 3 surface) in heating-dominated buildings, and on the number 2 surface (inside surface of the exterior pane) in cooling-dominated buildings.

NOTE: Design must meet the requirements of UFC 1-200-02, "High Performance and Sustainable Building Requirements" which invokes the requirements within UFC 3-101-01, "Architecture". UFC 1-200-02 and UFC 3-101-01 make references throughout to various ASHRAE documents governing energy efficiency and requirements for the components of building envelope design including fenestrations and glazing.

****

Interior and exterior glass panes for Low-E insulating units must be Type I annealed flat glass, Class [1-clear] [2-tinted] with anti-reflective low-emissivity coating or heat-strengthened or fully tempered glass complying with ASTM C1048, Condition C on [No. 2 surface (inside surface of exterior pane)][No. 3 surface (inside surface of interior pane)], Quality q3 - glazing select, conforming to ASTM C1036. Glass performance must be U value maximum of [_____] [W/m2-K] [Btu/hr-ft2-F], Solar Heat Gain Coefficient (SHGC) maximum of [_____]. Color must be [green] [gray]

[bronze] [blue] [_____] .

2.4 PLASTIC GLAZING

****
NOTE: Plastic glazing may be used in some areas where high resistance to breakage is required, but combustibility must be considered in the design. See manufacturers' literature for many types available. Do not specify plastic for glazing unprotected openings, for roof panels, or for skylights without consulting UFC 3-600-01, "Fire Protection Engineering for Facilities" and NAVFACENGCOM Code 04F.
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NOTE: Polycarbonate is more expensive than acrylic and should only be selected for locations which are highly vulnerable to vandalism or other types of abuse. Avoid polycarbonate if possible due to potentially hazardous constituent chemicals (including Bisphenol A). Where only one material is used in the project, the other one should be deleted.

Where translucent plastic sheets are required, locations will be shown on the contract drawings. The following will be added at the end of the paragraph:

"Translucent sheets, where shown, must be white having light transmission of [_____] percent for sheets [_____] mm inches thick, or clear with matte finish."

The light transmission required for a particular sheet thickness will be selected from plastic sheet manufacturer's catalogs.

Acrylic-plastic is a combustible material and must not be used in areas where exposure to fire would create a hazard condition.

Consider glazing with aerogel insulation between two panels of plastic, producing the highest visual transmittance with the highest insulation values currently available. Plastic glazing must have a U-factor maximum of the specified U-factor for insulating glass units. Verify availability and cost before specifying aerogel.
****

Plastic glazing must have a U-factor maximum of [_____] W per square m by K Btu per square foot by hr by degree F.[Plastic glazing must include a [16] [32] [_____] mm [0.63] [1.26] [_____] inch layer of aerogel between panels.]

Certificates stating that the plastic glazing meets the specified requirements. Labels or manufacturers marking affixed to the glass will

be accepted in lieu of certificates.

2.4.1 Acrylic Sheet

ASTM D4802, [Type I, regular] [Type II, heat resistant,] [clear and smooth on both sides] [translucent, textured on both sides,] [gray tint,] [bronze tint,] ultraviolet stabilized, [scratch resistant,] [_____] [6] [_____] mm [0.236] [_____] in. thick.

2.4.2 Polycarbonate Sheet

ANSI Z97.1, [Clear and smooth both sides] [Translucent, textured both sides] [Gray tint] [Bronze tint] [mar-resistant] [high abrasion resistant], ultraviolet stabilized, [_____] mm inch thick and listed in UL MEAPD as burglar resisting.

2.4.3 Extruded Polycarbonate Profiled Sheet

Provide [double] [triple] walled, surface treated for improved UV resistance, offering thermal efficiency and impact strength.

2.4.4 Bullet-Resistant Plastic Sheet

****
NOTE: Bullet-resisting glazing material is available in four power ratings to resist scattered shots from (1) medium-power small arms (MSA); (2) high-power small arms (HSA); (3) super-power small arms (SSA); and (4) high-power rifles (HR). Bullet-resisting acrylic sheet is listed by UL for MSA rating only and is 25.4 mm one inch thick. Bullet-resisting polycarbonate sheet is listed for MSA 25.4 mm one inch and for HSA and SSA ratings 31.8 mm 1 1/4 inch. Consult manufacturers for exact thicknesses and availability.
****

Cast acrylic sheet or mar-resistant polycarbonate sheet laminated with a special interlayer, and listed in UL 752 as bullet resisting, Class [I] [II] [III], [clear] [_____] in color.[Provide [_____].]

2.5 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, IGMA TM-3000, IGMA TB-3001, and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted must be gray or neutral color. Sealant testing must be performed by a testing agency qualified according to ASTM C1021.

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.[Include cleaning instructions for plastic sheets.]

2.5.1 Putty and Glazing Compound

Provide glazing compound as recommended by manufacturer for face-glazing metal sash. Putty must be linseed oil type. Do not use putty and glazing compounds with insulating glass or laminated glass.

2.5.2 Glazing Compound

Use for face glazing metal sash. Do not use with insulating glass units or laminated glass.

2.5.3 Sealants

Provide elastomeric [and structural] sealants.

2.5.3.1 Elastomeric Sealant

ASTM C920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing [wood] [and] [metal] sash. Sealants must be chemically compatible with setting blocks, edge blocks, and sealing tapes[, with sealants used in manufacture of insulating glass units] [, and with plastic sheet]. Color of sealant must be white.

2.5.3.2 Structural Sealant

ASTM C1184, Type S.

2.5.4 Joint Backer

Joint backer must have a diameter size at least 25 percent larger than joint width; type and material as recommended in writing by glass and sealant manufacturer.

2.5.5 Glazing Tapes

2.5.5.1 Back-Bedding Mastic Glazing Tapes

Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

a. AAMA 804.3 tape, where indicated.

b. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

c. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.5.5.2 Expanded Cellular Glazing Tapes

Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5.6 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with ASTM D2287. Use only where glazing rabbet is designed for tape and tape is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes must be chemically compatible with the product being set.

2.5.7 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks must be dense extruded type conforming to ASTM C509 and ASTM D395, Method B, Shore A durometer between 70 and 90. Edge blocking must be Shore A durometer of 50 (plus or minus 5). Provide silicone setting blocks when blocks are in contact with silicone sealant. Profiles, lengths and locations must be as required and recommended in writing by glass manufacturer. Block color must be [black][_____].

2.5.8 Glazing Gaskets

Glazing gaskets must be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening must be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets must be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Provide glazing gasket profiles as recommended by the manufacturer for the intended application.

2.5.8.1 Fixed Glazing Gaskets

Fixed glazing gaskets must be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C509, Type 2, Option 1.

2.5.8.2 Wedge Glazing Gaskets

Wedge glazing gaskets must be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C864, Option 1, Shore A durometer between 65 and 75.

2.5.8.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing must be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.5.9 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to surface.

[2.6 MIRROR ACCESSORIES

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NOTE: Use for Army projects only. Navy projects will specify Mirrors and Accessories in Division 10, Specialties.
****

2.6.1 Mastic

Mastic for setting mirrors must be a [polymer] [_____] type mirror mastic resistant to water, shock, cracking, vibration and thermal expansion. Provide mastic compatible with mirror backing paint, and as approved by mirror manufacturer.

2.6.2 Mirror Frames

Provide mirrors with mirror frames (J-mold channels) fabricated of one-piece roll-formed Type 304 stainless steel with No. 4 brushed satin finish and concealed fasteners which will keep mirrors snug to wall. Frames must be 32 by 6 by 6 mm 1-1/4 by 1/4 by 1/4 inch continuous at top and bottom of mirrors. Concealed fasteners of type to suit wall construction material must be provided with mirror frames.

2.6.3 Mirror Clips

Provide clips with concealed fasteners of type to suit wall construction material.

]PART 3 EXECUTION

Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

3.1 PREPARATION

Preparation, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the

glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Sheet Glass

Cut and set with the visible lines or waves horizontal.

3.2.2 Patterned Glass

Set glass with one patterned surface with smooth surface on the weather side. When used for interior partitions, place the patterned surface in same direction in all openings.

3.2.3 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation must conform to applicable recommendations of IGMA TB-3001 and IGMA TM-3000.

3.2.4 Installation of Wire Glass

Install glass for fire doors in accordance with installation requirements of NFPA 80.

3.2.5 Installation of Heat-Absorbing Glass

Provide glass with clean-cut, factory-fabricated edges. Field cutting will not be permitted.

3.2.6 Installation of Laminated Glass

Sashes which are to receive laminated glass must be weeped to the outside to allow water drainage into the channel.

3.2.7 Plastic Sheet

Conform to manufacturer's recommendations for edge clearance, type of sealant and tape, and method of installation.

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass must be clean at the time the work is accepted.[Clean plastic sheet in accordance with manufacturer's instructions.]

3.4 PROTECTION

Protect glass work immediately after installation. Identify glazed openings with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Protect reflective glass with a protective material to eliminate any contamination of the reflective coating. Place

protective material far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Upon removal, separate protective materials for reuse or recycling. Remove and replace glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities with new units.

3.5 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of inch-pound measurements, and not on metric measurement commonly agreed to by the manufacturers or other parties. The inch-pound and metric measurements are as follows:

PRODUCTS	INCH-POUND	METRIC
Glass	1/8 inch	3 mm
	3/16 inch	4.5 mm
	7/32 inch	6 mm
	1/4 inch	6 mm
	3/8 inch	10 mm
Interlayer	0.015 inch	0.38 mm
Glazing Channels	1/4 inch	6 mm

-- End of Section --