



Designation: E1300 – 24

Standard Practice for Determining Load Resistance of Glass in Buildings¹

This standard is issued under the fixed designation E1300; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This practice covers procedures to determine the load resistance (LR) of specified glass types, including combinations of glass types used in a sealed insulating glass (IG) unit, exposed to a uniform lateral load of short or long duration, for a specified probability of breakage.

1.2 This practice applies to vertical and sloped glazing in buildings for which the specified design loads consist of wind load, snow load and self-weight with a total combined magnitude less than or equal to 15 kPa (315 psf). This practice shall not apply to other applications including, but not limited to, balustrades, glass floor panels, aquariums, structural glass members, and glass shelves.

1.3 This practice applies only to monolithic and laminated glass constructions of rectangular shape with continuous lateral support along one, two, three, or four edges. This practice assumes that (1) the supported glass edges for two, three, and four-sided support conditions are simply supported and free to slip in plane; (2) glass supported on two sides acts as a simply supported beam; and (3) glass supported on one side acts as a cantilever. For insulating glass units, this practice only applies to insulating glass units with four-sided edge support.

1.4 This practice does not apply to any form of wired, patterned, sandblasted, drilled, notched, or grooved glass. This practice does not apply to glass with surface or edge treatments that reduce the glass strength.

NOTE 1—Ceramic enamel is known to affect glass load resistance. Consult the manufacturer for guidance.

1.5 This practice addresses only the determination of the resistance of glass to uniform lateral loads. The final thickness and type of glass selected also depends upon a variety of other factors (see 6.3).

1.6 Charts in this practice provide a means to determine approximate maximum lateral glass deflection. Appendix X1 provides additional procedures to determine maximum lateral deflection for glass simply supported on four sides.

¹ This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.52 on Glass Use in Buildings.

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1.7 Appendix X2 lists the key variables used in calculating the mandatory type factors in Tables 1-3 and comments on their conservative values.

1.8 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

C1036 Specification for Flat Glass

C1048 Specification for Heat-Strengthened and Fully Tempered Flat Glass

C1172 Specification for Laminated Architectural Flat Glass

D4065 Practice for Plastics: Dynamic Mechanical Properties: Determination and Report of Procedures

E631 Terminology of Building Constructions

3. Terminology

3.1 Definitions:

3.1.1 Refer to Terminology E631 for additional terms used in this practice.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *acid etched glass, n*—glass surface that has been treated primarily with hydrofluoric acid and potentially in combination with other agents. Acid etched glass strength shall be considered as equivalent to float glass in this practice provided the glass thickness conforms to Specification C1036.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

TABLE 1 Glass Type Factors (GTF) for a Single Lite of Monolithic or Laminated Glass (LG)

Glass Type	GTF	
	Short Duration Load (3 s)	Long Duration Load (30 days)
AN	1.0	0.43
HS	2.0	1.3
FT	4.0	3.0

TABLE 4 Nominal and Minimum Glass Thicknesses

Nominal Thickness or Designation, mm (in.)	Minimum Thickness, mm (in.)
2.0 (picture)	1.80 (0.071)
2.5 ($\frac{3}{32}$)	2.16 (0.085)
2.7 (lami)	2.59 (0.102)
3.0 ($\frac{1}{8}$)	2.92 (0.115)
4.0 ($\frac{5}{32}$)	3.78 (0.149)
5.0 ($\frac{3}{16}$)	4.57 (0.180)
6.0 ($\frac{1}{4}$)	5.56 (0.219)
8.0 ($\frac{5}{16}$)	7.42 (0.292)
10.0 ($\frac{3}{8}$)	9.02 (0.355)
12.0 ($\frac{1}{2}$)	11.91 (0.469)
16.0 ($\frac{5}{8}$)	15.09 (0.595)
19.0 ($\frac{3}{4}$)	18.26 (0.719)
22.0 ($\frac{7}{8}$)	21.44 (0.844)
25.0 (1)	24.61 (0.969)

TABLE 2 Glass Type Factors (GTF) for Double Glazed Insulating Glass (IG), Short Duration Load

Lite No. 1 Monolithic Glass or Laminated Glass Type	Lite No. 2 Monolithic Glass or Laminated Glass Type					
	AN		HS		FT	
	GTF1	GTF2	GTF1	GTF2	GTF1	GTF2
AN	0.9	0.9	1.0	1.9	1.0	3.8
HS	1.9	1.0	1.8	1.8	1.9	3.8
FT	3.8	1.0	3.8	1.9	3.6	3.6

TABLE 3 Glass Type Factors (GTF) for Double Glazed Insulating Glass (IG), Long Duration Load (30 day)

Lite No. 1 Monolithic Glass or Laminated Glass Type	Lite No. 2 Monolithic Glass or Laminated Glass Type					
	AN		HS		FT	
	GTF1	GTF2	GTF1	GTF2	GTF1	GTF2
AN	0.39	0.39	0.43	1.25	0.43	2.85
HS	1.25	0.43	1.17	1.17	1.25	2.85
FT	2.85	0.43	2.85	1.25	2.71	2.71

3.2.2 *aspect ratio (AR)*, *n*—for glass simply supported on four sides, the ratio of the long dimension of the glass to the short dimension of the glass is always equal to or greater than 1.0. For glass simply supported on three sides, the ratio of the length of one of the supported edges perpendicular to the free edge, to the length of the free edge, is equal to or greater than 0.5.

3.2.3 *glass breakage*, *n*—the fracture of any lite or ply in monolithic, laminated, or insulating glass.

3.2.4 Glass Thickness:

3.2.4.1 *thickness designation for laminated glass (LG)*, *n*—a term used to specify a LG construction based on the combined thicknesses of component plies.

(1) Add the minimum thicknesses of the individual glass plies and the nominal interlayer thickness. If the sum of all interlayer thicknesses is greater than 1.52 mm (0.060 in.) use 1.52 mm (0.060 in.) in the calculation.

(2) Select the nominal thickness or designation in [Table 4](#) having the closest minimum thickness that is equal to or less than the value obtained in [3.2.4.1 \(1\)](#).

(3) Exceptions—The construction of two 6 mm ($\frac{1}{4}$ in.) glass plies plus 0.38 mm (0.015 in.) or 0.76 mm (0.030 in.) interlayer shall be defined as 12 mm ($\frac{1}{2}$ in.). The construction of two 2.5 mm ($\frac{3}{32}$ in.) glass plies plus 1.52 mm (0.060 in.) interlayer shall be defined as 5 mm ($\frac{3}{16}$ in.). The construction of two 4 mm ($\frac{5}{32}$ in.) glass plies plus any thickness interlayer shall be defined as 8 mm ($\frac{5}{16}$ in.).

3.2.4.2 *thickness designation for monolithic glass*, *n*—a term that defines a designated thickness for monolithic glass as specified in [Table 4](#) and Specification [C1036](#).

3.2.5 Glass Types:

3.2.5.1 *annealed (AN) glass*, *n*—a flat, monolithic, glass lite of uniform thickness where the residual surface stresses are nearly zero as defined in Specification [C1036](#).

3.2.5.2 *fully tempered (FT) glass*, *n*—a flat, monolithic, glass lite of uniform thickness that has been subjected to a special heat treatment process where the residual surface compression is not less than 69 MPa (10 000 psi) or the edge compression not less than 67 MPa (9700 psi) as defined in Specification [C1048](#).

3.2.5.3 *heat strengthened (HS) glass*, *n*—a flat, monolithic, glass lite of uniform thickness that has been subjected to a special heat treatment process where the residual surface compression is not less than 24 MPa (3500 psi) or greater than 52 MPa (7500 psi) as defined in Specification [C1048](#).

3.2.5.4 *insulating glass (IG) unit*, *n*—any combination of two or three glass lites that enclose one or two sealed spaces respectively, filled with air or other gas.

3.2.5.5 *laminated glass (LG)*, *n*—a flat lite of uniform thickness consisting of two or more monolithic glass plies bonded together with an interlayer material as defined in Specification [C1172](#).

(1) *Discussion*—Many different interlayer materials are used in LG. The information in this practice applies only to polyvinyl butyral (PVB) interlayer or those interlayers that demonstrate equivalency according to [Appendix X8](#).

3.2.6 *glass type factor (GTF)*, *n*—a multiplying factor for adjusting the LR of different glass types, that is, AN, HS, or FT in monolithic glass, LG, or IG constructions.

3.2.7 *lateral, adj*—perpendicular to the glass surface.

3.2.8 *load*, *n*—a uniformly distributed lateral pressure.

3.2.8.1 *glass weight load*, *n*—the dead load component of the glass weight.

3.2.8.2 *load resistance (LR)*, *n*—the uniform lateral load that a glass construction can sustain based upon a given probability of breakage and load duration.

(1) *Discussion*—Multiplying the non-factored load (NFL) from figures in [Annex A1](#) by the relevant GTF and load share