



Designation: C1036 – 21

Standard Specification for Flat Glass¹

This standard is issued under the fixed designation C1036; 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 reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers the requirements for annealed, monolithic flat soda-lime glass supplied as cut sizes or stock sheets.

1.2 This specification is focused upon the quality of flat glass as produced. The specification is applicable for laboratory and field evaluation only to the extent that such evaluation can be carried out in accordance with the test method(s) prescribed herein.

1.3 This specification covers the quality requirements of flat, transparent, clear, low-iron, and tinted glass. This glass is intended to be used primarily for architectural glazing products such as coated glass, insulating glass units, laminated glass, mirrors, and spandrel glass.

NOTE 1—Reflective distortion is not addressed in this specification.

1.4 This specification covers the quality requirements of patterned or wired glasses intended to be used primarily for decorative and general glazing applications.

1.5 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.

1.6 *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.*

1.7 *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.*

¹ This specification is under the jurisdiction of ASTM Committee C14 on Glass and Glass Products and is the direct responsibility of Subcommittee C14.08 on Flat Glass.

Current edition approved April 1, 2021. Published May 2021. Originally approved in 1985. Last previous edition approved in 2016 as C1036 – 16. DOI: 10.1520/C1036-21.

2. Referenced Documents

2.1 *ASTM Standard:*²

C162 Terminology of Glass and Glass Products

2.2 *NFRC Standard:*³

NFRC 300 Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems

3. Terminology

3.1 *Definitions:*

3.1.1 For additional definitions of terms, refer to Terminology C162.

3.2 *Definitions of Key Terms:*

3.2.1 *associated distortion, n*—alteration of viewed images caused by variations in glass flatness or inhomogeneous portions within the glass.

3.2.2 *bevel, n*—angled surface at the edge of a lite of glass.

3.2.3 *blemish, n*—imperfection in the body or on the surface of the glass; for the purpose of this specification, blemishes are divided into two categories; blemishes not specifically mentioned shall each be compared to the blemish that they most closely resemble.

3.2.3.1 *linear blemish, n*—scratches, rubs, digs, and other similar imperfections, which may be straight or curved in nature; if curved, the length of such a blemish is to be measured from end to end along the curve.

3.2.3.2 *point blemish, n*—crush, knots, dirt, stones, gaseous inclusions, tin drip, and other similar imperfections.

3.2.4 *bow, n*—the deviation in flatness of a lite of glass, expressed over the entire width or length dimension of the lite or over a smaller, local span.

3.2.5 *chip, n*—indentation in the glass edge as a result of breakage of a small fragment; chips fall into two categories:

3.2.5.1 *shell chip, n*—any chip other than a v-chip.

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.

³ Available from National Fenestration Rating Council (NFRC), 6305 Ivy Ln., Suite 140, Greenbelt, MD 20770, <http://www.nfrc.org>.

TABLE 5 Allowable Point Blemish Size and Distribution For Cut Size Qualities^A

Blemish Size mm (in.) ^{B,C,D}	Q1 Quality 1	Q2 Quality 2	Q3 Quality 3	Q4 Quality 4
< 0.50 (0.02)	Allowed ^E	Allowed ^E	Allowed	Allowed
$\geq 0.50 < 0.80$ $\geq (0.02) < (0.03)$	Allowed with a minimum separation of 1500 mm (60 in.) ^F	Allowed with a minimum separation of 600 mm (24 in.) ^F	Allowed	Allowed
$\geq 0.80 < 1.20$ $\geq (0.03) < (0.05)$	None allowed	Allowed with a minimum separation of 1200 mm (48 in.) ^F	Allowed	Allowed
$\geq 1.20 < 1.50$ $\geq (0.05) < (0.06)$	None allowed	Allowed with a minimum separation of 1500 mm (60 in.) ^F	Allowed with a minimum separation of 600 mm (24 in.) ^F	Allowed
$\geq 1.50 < 2.00$ $\geq (0.06) < (0.08)$	None allowed	None allowed	Allowed with a minimum separation of 600 mm (24 in.) ^F	Allowed
$\geq 2.00 < 2.50$ $\geq (0.08) < (0.10)$	None allowed	None allowed	None allowed	Allowed with a minimum separation of 600 mm (24 in.) ^F
≥ 2.5 $\geq (0.10)$	None allowed	None allowed	None allowed	None allowed

^A Table values are for 6 mm (1/4 in.) and less. For glass thicker than 6 mm (1/4 in.) and less than or equal to 12 mm (1/2 in.), proportionally larger blemishes are permitted but with the same minimum separation distances. (For example, a 12 mm Q3 sample with a blemish size of ≥ 3 mm < 4 mm and minimum separation of 600 mm would be allowed.) **Table 5** does not apply to glass thicker than 12 mm (1/2 in.). Allowable blemishes for glass thicker than 12 mm (1/2 in.) shall be determined by agreement between the buyer and the seller.

^B See 6.1.1.1 for detection of point blemishes.

^C See 6.1.1.2 for measurement of point blemishes.

^D For Q1 and Q2 only, the blemish size includes associated distortion (see 6.1.1.2).

^E Provided that normally allowable blemishes do not form a cluster that is detectable at 1800 mm (6 ft).

^F See 6.1.1.4 for minimum blemish separation.

TABLE 8 Allowable Distortion for Cut Size and Stock Sheet Qualities of Type 1—Transparent Flat Glass

	Q1	Q2	Q3	Q4
Allowable Vision Interference Angle ^A	≥ 60°	≥ 50°	≥ 35°	≥ 25°

^A See 6.1.2 and Fig. 2 for determining the vision interference angle.

TABLE 7 Allowable Linear Blemish Size and Distribution for Cut Size and Stock Sheet Qualities

Linear Blemish Size ^A Intensity Length	Q1 Quality 1 Distribution	Q2 Quality 2 Distribution	Q3 Quality 3 Distribution	Q4 Quality 4 Distribution
Faint \leq 75 mm (3 in.)	Allowed with a minimum separation of 1500 mm (60 in.)	Allowed with a minimum separation of 1200 mm (48 in.)	Allowed	Allowed
Faint $>$ 75 mm (3 in.)	None allowed	None allowed	Allowed	Allowed
Light \leq 75 mm (3 in.)	None allowed	Allowed with a minimum separation of 1200 mm (48 in.)	Allowed	Allowed
Light $>$ 75 mm (3 in.)	None allowed	None allowed	Allowed	Allowed
Medium \leq 75 mm (3 in.)	None allowed	None allowed	Allowed with a minimum separation of 600 mm (24 in.)	Allowed
Medium $>$ 75 mm (3 in.)	None allowed	None allowed	None allowed	Allowed
Heavy \leq 150 mm (6 in.)	None allowed	None allowed	None allowed	Allowed with a minimum separation of 600 mm (24 in.)
Heavy $>$ 150 mm (6 in.)	None allowed	None allowed	None allowed	None allowed

^A See Table 12 ("Blemish Intensity Chart") for definitions of Faint, Light, Medium and Heavy blemish intensity using viewing detection distance.

TABLE 4 Dimensional Tolerances for Rectangular Shapes of Type 1—Transparent Flat Glass

Nominal Designation		Thickness Range				Length and Width Tolerance ^A				Squareness (D1–D2)			
SI Designation, ^B mm	Traditional Designation	mm		in.		Cut Size		Stock Sheet		Cut Size		Stock Sheet	
		min	max	min	max	± mm	(± in.)	± mm	(± in.)	mm	(in.)	mm	(in.)
1.0	micro-slide	0.79	1.24	0.031	0.049	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
1.5	photo	1.27	1.78	0.05	0.07	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
2	picture	1.80	2.13	0.071	0.084	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
2.5	single	2.16	2.57	0.085	0.101	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
2.7	lami	2.59	2.90	0.102	0.114	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
3 ^C	double, 1/8 in.	2.92	3.40	0.115	0.134	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
4	5/32 in.	3.78	4.19	0.149	0.165	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
5	3/16 in.	4.57	5.05	0.18	0.199	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
6	1/4 in.	5.56	6.20	0.219	0.244	1.6	(1/16)	6.4	(1/4)	2.0	(5/64)	3.0	(1/8)
8	5/16 in.	7.42	8.43	0.292	0.332	2.0	(5/64)	6.4	(1/4)	2.8	(7/64)	6.0	(1/4)
10	3/8 in.	9.02	10.31	0.355	0.406	2.4	(3/32)	6.4	(1/4)	3.4	(1/8)	6.0	(1/4)
12	1/2 in.	11.91	13.49	0.469	0.531	3.2	(1/8)	6.4	(1/4)	4.5	(11/64)	10.0	(3/8)
16	5/8 in.	15.09	16.66	0.595	0.656	4.0	(5/32)	6.4	(1/4)	5.7	(7/32)	12.0	(1/2)
19	3/4 in.	18.26	19.84	0.719	0.781	4.8	(3/16)	6.4	(1/4)	6.8	(1/4)	14.0	(9/16)
22	7/8 in.	21.44	23.01	0.844	0.906	5.6	(7/32)	6.4	(1/4)	7.9	(19/64)	16.0	(5/8)
25	1 in.	24.61	26.19	0.969	1.031	6.4	(1/4)	6.4	(1/4)	9.0	(11/32)	18.0	(3/4)

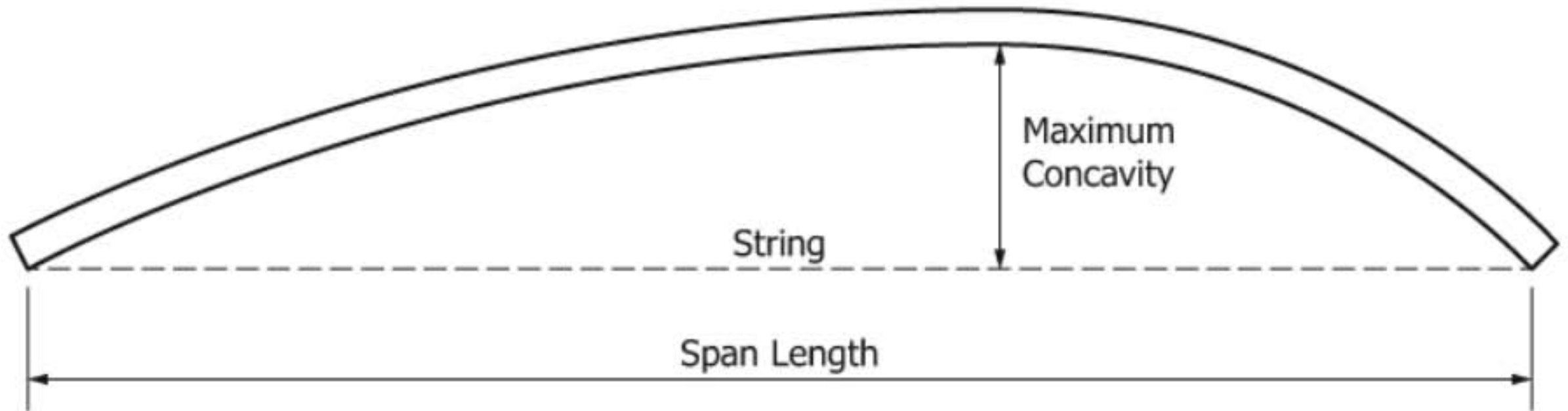
^A Length and width of cut size and stock sheets of flat glass include flares and bevels.

^B These designations apply only to ASTM International and may not reflect other international standards.

^C Within the 3 mm designation there are some applications that may require different thickness ranges such as DST. (Typical minimum thickness for DST is 0.120 in.)

Bow without Inflection Point

Measurement of the concave surface is required.



Bow with Inflection Point

Measurement of both surfaces is required.

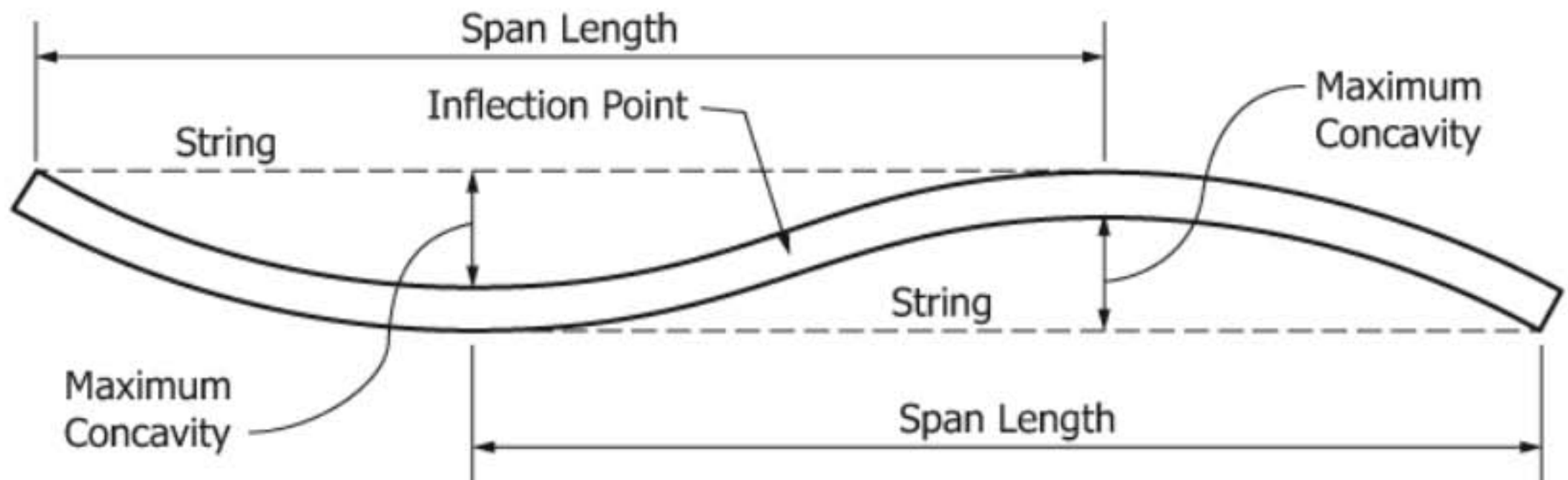


FIG. X1.1 Exaggerated View of Glass Bow