

Guidelines For Fully Tempered Interior Butt-Glazed Fixed Glass Panels

- NGA/GANA Tempered Glass Thickness Recommendations for Butt-Joint Interior Glass Partitions
- International Building Code (IBC) Requirements
- Excessive Glass Deflection: Two-side Support (Butt-Joint) Glazing

The National Glass Association (NGA) with GANA, has issued an update in its Engineering Standards Manual providing minimum thickness guidelines for fully tempered glass for INTERIOR glass partitions that are butt-joint glazed (restrained at the top and bottom only).

These recommendations address an issue of concern in these applications that has frequently occurred. Some installations have been under-designed and installed with inadequate glass thickness, resulting in excessive glass deflection under indoor loads caused by stack action, HVAC changes, or doors to the outdoors opening and closing, and people pushing or leaning on the glass. Since glass is perfectly elastic up to the point of failure, when it is deflected from a load, it will return to its original shape after the load is removed. However, glass that is too thin can tremble, shimmer, or deflect excessively even though the fully tempered glass meets design probability of breakage requirements.

TABLE 1 of the attached NGA/GANA guidelines provides recommended minimum glass thickness for fully tempered glass that is used in simply supported interior partitions mounted or restrained at the top and bottom only.

IBC Code 2403.4 states . . . "INTERIOR GLAZED AREAS: Where interior glazing is installed adjacent to a walking surface, the DIFFERENTIAL DEFLECTION of two adjacent unsupported sides shall not be greater than the thickness of the panels when a force of 50 pounds per linear foot is applied horizontally to one panel at a point up to 42 inches above the walking surface."

In addition, IBC Code 1607.15 states ... "Interior walls and partitions that exceed 6 feet in height, including their finish materials, shall have adequate strength and stiffness to resist the loads to which they are subject but not less than a horizontal load of 5 psf."

Two columns in the table show the recommended minimum thickness of fully tempered glass required to meet the IBC code for lites that are not linked together (open joints). The other two columns show the recommended minimum thickness of fully tempered glass to meet the IBC code for lites that are linked with silicone or permanent clamps.

The loads established by the IBC are minimum design criteria that may be combined for specific glass thickness selection. When design requirements are beyond these guidelines, please refer to engineering analysis.

For outdoor applications of butt-joint glazing, with higher design wind loads than indoor applications, similar under-designed uses of glass, which is too thin, resulting in excessive deflection, have also occurred. To address such applications, use ASTM E1300 "Standard Practice for Determining the Minimum Thickness of Annealed Glass Required to Resist a Specified Load".

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The fixed panels of interior glass partitions mounted or restrained on only two sides (top and bottom) require special design considerations:

The thickness of glass required to provide adequate strength in these applications varies with the length of the unsupported span and applied loading. Glass strength is a primary concern for proper design; however, deflection characteristics are also important and should be considered in the design characteristics.

Glass held only on two sides is much more flexible than glass supported on all four sides. If the glass is too thin, small fluctuations of interior air pressure can cause the glass to tremble or shimmer. People pushing or leaning on glass that is too thin will noticeably deflect the glass. As the unsupported span or height of the glass panels increases, the glass thickness must also increase to maintain a reasonable stiffness. TABLE 1 below shows recommended minimum thicknesses of FULLY TEMPERED glass for various glass heights used in interior butt-glazed fixed glass panels.

TABLE 1: Recommended MINIMUM thickness for FULLY TEMPERED glass used in BUTT-GLAZED FIXED INTERIOR PANELS mounted or restrained at TOP and BOTTOM only.

	IBC 1607.14 ^{1,2}	IBC 1607.14 ^{1,3}	IBC 2403.4 ^{1,4}	IBC 2403.4 ^{1,3}
	Load - 5 lb/sq.ft. (psf)	Load - 5 lb/sq.ft. (psf)	Load - 50 lb/ft. (plf)	Load - 50 lb/ft. (plf)
Unsupported span from top to bottom of glass	when open joints	when linked with silicone or permanent fastener	when open joints	when linked with silicone or permanent fastener
Up to 5 ft. (1.5m)	3/8" (9mm)	3/8" (9mm)	1/2" (12mm)	3/8" (9mm)
Over 5 ft (1.5m) up to 6 ft (1.8m)	3/8" (9mm)	3/8" (9mm)	1/2" (12mm)	3/8" (9mm)
Over 6 ft (1.8m) up to 7 ft (2.1m)	1/2" (12mm)	3/8" (9mm)	5/8" (15mm)	3/8" (9mm)
Over 7 ft (2.1m) up to 8 ft (2.4m)	1/2" (12mm)	1/2" (12mm)	5/8" (15mm)	1/2" (12mm)
Over 8 ft (2.4m) up to 9 ft (2.7m)	5/8" (15mm)	1/2" (12mm)	5/8" (15mm)	1/2" (12mm)
Over 9 ft (2.7m) up to 10 ft (3m)	5/8" (15mm)	1/2" (12mm)	3/4" (19mm)	1/2" (12mm)
Over 10 ft (3m) up to 11 ft (3.4m)	3/4" (19mm)	5/8" (15mm)	3/4" (19mm)	5/8" (15mm)
Over 11 ft (3.4m) up to 12 ft (3.7m)	3/4" (19mm)	5/8" (15mm)	3/4" (19mm)	5/8" (15mm)
Over 12 ft (3.7m) up to 13 ft (4m)	7/8" (22mm)	5/8" (15mm)	7/8" (22mm)	5/8" (15mm)
Over 13 ft (4m) up to 14 ft (4.3m)	7/8" (22mm)	3/4" (19mm)	7/8" (22mm)	3/4" (19mm)
Over 14 ft (4.3m) up to 15 ft (4.6m)	1" (25mm)	3/4" (19mm)	7/8" (22mm)	3/4" (19mm)
Over 15 ft (4.6m) up to 16 ft (4.9m)	1" (25mm)	3/4" (19mm)	7/8" (22mm)	3/4" (19mm)
Over 16 ft (4.9m) up to 17 ft (5.2m)	1" (25mm)	7/8" (22mm)	7/8" (22mm)	7/8" (22mm)
Over 17 ft (5.2m) up to 18 ft (5.58m)	use engineering analysis	7/8" (22mm)	1" (25mm)	7/8" (22mm)
Over 18 ft (5.5m)	use engineering analysis	use engineering analysis	use engineering analysis	use engineering analysis

1. These numbers are based on the assumption that bottom of the glass attachment is at the same height as the walking surface.
2. Guidelines are based on IBC 2403.4 deflection limit of the thickness of the glass panel.
3. Guidelines for spans up to 10' are based on a deflection limit of 1.6" (based on pullout of less than 1/16"); guidelines for spans greater than 10' are based on a deflection limit of 2" (based on pullout of 3/32"). Larger deflections should be reviewed by designer.
4. Guidelines based on IBC 2403.4 deflection limit of the thickness of the glass panel and loading from IBC 2404.4

Open narrow joints between butt-glazed glass panels may catch or pinch fingers. The best preventative is to avoid open joints by filling them with silicone. An alternative is to install permanent clamps approximately every four feet to couple the adjoining panels together to prevent relative movement between panels. The gap between panels with unfilled joints should be such that fingers cannot be inserted and trapped. Structural joints or permanently clipping adjacent panels do not add to the structural strength or rigidity of the assembly.

Recommendations For Fully Tempered Interior Butt-Glazed Fixed Glass Panels

HISTORY TABLE		
ITEM	DATE	DESCRIPTION
Original Publication	May 1995	
Revision #1	1/15/2002	Revised and transferred to TD-114
Revision #2	9/9/2014	Updated header on pg. 3
Revision #3	10/04/2016	Updated to Vitro logo and format
Revision #4	1/24/2019	Updated to Vitro logo and format
Revision #5	10/29/2019	Revised with table from NGA/GANA Engineering Standards Manual section 9
Revision #6	4/15/2021	Correct load designations in Table 1 column headings.
Revision #7	12/7/2023	Correct load units in Table 1 column headings to match NGA ESM.

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