



## Laminated Glass

### Description

Laminated safety glass for use in building is normally constructed of two or more layers of glass bonded together with plastic interlayers between. If the glass is broken, the high strength interlayer ensures that the glass is held in place, reducing the risk of shards of glass causing serious harm, where there may be a risk of human impact.

Thicker laminated glass, with increasing numbers of layers are used for increasing levels of security, blast and bullet resistant glazing.

The most common type of interlayer is Polyvinyl butyral (PVB). There are other types of interlayer, but they tend to be used for special circumstances.

PVB may be used in a single or multiple thicknesses in order to provide greater strength and resistance to penetration. Thicker panes of glass may be used as appropriate, to withstand wind, barrier and snow loads.

A single layer thickness is 0.38 mm thick, a double layer 0.76, triple 1.14, etc. The number of layers depends on the classification necessary for the project where they are to be installed.

### Manufacture

In its most simple form, there are three layers, two pieces of glass and one interlayer, referred to as three ply laminate.

The three layers are assembled together prior to being placed into an autoclave, where they are subjected to heat and pressure, allowing the plastic interlayer to soften and adhere securely to the glass panes on either side.

Float glass may also be toughened or heat strengthened prior to being laminated, although these additional processes will affect the optical appearance when compared to the use of float glass.

### Manufacturing sizes

#### Annealed Laminated Glass

Glass type	Nominal Glass Thickness (mm)	Maximum Area (mm)	Maximum Length (mm)
PVB laminated annealed glass	6	2.5	2500
	8	4.5	3000
	10	6.5	3500
	≥12	8	4500
The above dimensional limits relate to safe handling and processing capabilities, any other applied loads, i.e. wind, snow, barriers, etc. should also be considered separately			

#### Toughened Laminated Glass

Glass type	Nominal Glass Thickness (mm)	Maximum Width (mm)	Maximum Length (mm)
PVB laminated toughened glass	8	1400	2900
	10	2000	4000
	≥12	2800	4800
The above dimensional limits relate to safe handling and processing capabilities, any other applied loads, i.e. wind, snow, barriers, etc. should also be considered separately			

#### Heat Strengthened Laminated Glass

Glass type	Nominal Glass Thickness (mm)	Maximum Width (mm)	Maximum Length (mm)
PVB laminated heat strengthened glass	8	1400	2900
	10	2000	4000
	≥12	2800	4800
The above dimensional limits relate to safe handling and processing capabilities, any other applied loads, i.e. wind, snow, barriers, etc. should also be considered separately			

Enquiries outside the scope of these tables are welcome.



## Laminated Glass

### Shapes

Certain shapes are possible to process, please submit enquiries.

### Dimensional Tolerances

The table below is for length and width dimensions.

Dimension (mm)	Glass thickness (mm)		
	Overall thickness of laminate < 8 mm	Each glass pane < 10 mm	Any glass pane > 10 mm
≤ 2000	+ 3, - 2	+ 3.5, - 2	+ 5, - 3.5
≤ 3000	+ 4.5, - 2.5	+ 5, - 3	+ 6, - 4
> 3000	+5, - 3	+ 6, - 4	+7, - 5

### Quality

Laminated glass is manufactured and tested to comply with EN 12543: parts 1 to 6 Glass in building. Laminated glass and laminated safety glass, EN 14449: Glass in building – Laminated glass and laminated safety glass – Evaluation of conformity /Product standard, and where applicable, EN 12600: Glass in building - Pendulum test - Impact test method and classification for flat glass, and EN 356: Glass in building – Security glazing – Testing and classification of resistance against manual attack.

### Glazing

The installation of laminated safety glass should be in accordance with B.S. 8000: Code of Practice for Glazing and B.S. 6262: Glazing for Buildings.

### Weight

Laminated safety glass weighs the same as ordinary annealed float glass for use in buildings, plus an amount for the interlayer.

Glass weighs 2.5 Kg/m<sup>2</sup> for each millimetre in thickness plus 1 Kg/m<sup>2</sup> for the interlayer;

Glass Thickness mm	Weight Kg/m <sup>2</sup>
6.4	16
6.8	17
8.8	22
10.8	27
12.8	32

### Safety Impact Classification

#### EN 12600

Total Glass Thickness (mm)	Laminate Configuration	Impact Performance
6.4	33.1 PVB	2(B)2
6.8	33.2 PVB	1(B)1
8.4	44.1 PVB	2(B)2
8.8	44.2 PVB	1(B)1
10.4	55.1 PVB	2(B)2
10.8	55.2 PVB	1(B)1
12.4	66.1 PVB	1(B)1

#### Security Classification EN 356

Total Glass Thickness (mm)	Laminate configuration	Category of resistance
6.8	33.2 PVB	P2A
7.5	33.4 PVB	P4A
8.8	44.2 PVB	P2A
9.5	44.4 PVB	P4A
10.3	44.6 PVB	P5A
10.8	55.2 PVB	P2A*
11.5	55.4 PVB	P4A*
12.8	66.2 PVB	P2A*
13.5	66.4 PVB	P4A*

\*Thicker float glass panes with the same type and number of interlayers are assumed to have a similar performance and classification to those tested and certified.

The information quoted in this publication is only relevant to the performance of Dual Seal Glass products.

This publication gives a general description of the products and materials. It is the responsibility of the user to ensure that their use is appropriate for any particular application and that such application complies with all relevant local and national legislation, standards, codes of practice and other requirements.

Dual Seal Glass hereby disclaims all liability however arising from any error, or omission from this publication and for all consequences of relying on it.

#### Dual Seal Glass Limited

**403 Leeds Road**

**Huddersfield**

**HD2 1XU**

**Tel: 01484 420030**