Glass types

Why use glass?
> Unimpeded View
> Discreet
> Lets More Light In
> High Class Appearance

Timeless and elegant, glass offers the perfect balance of light, visibility and safety. We offer a range of thicknesses and variants, including privacy, tinted, self-cleaning, low-iron and laminated glass, plus coatings and films for enhanced performance. These options are available for both framed and frameless glass balustrades.

As determined by BS 6180: 1999 8.2, glass in freestanding barriers needs to be either toughened, or laminated and toughened, both conforming to BS 6206. All Sapphire's glazed products use toughened glass panels which have been through a special heating and cooling process, creating high compressive surface stresses that render the glass up to five times stronger than ordinary annealed float glass.

In exceptional circumstances, if the toughened glass breaks, it should fragment into small, non-injurious pieces, quite unlike the razor sharp shards of broken annealed glass.

Typically, glass infills provide a more cost effective solution than other panel infills like mesh, perforated or vertical bar panels - despite giving a high perceived value and a more desirable aesthetic appearance.

For additional safety, glass can also be heat soaked which reduces any possibility of spontaneous fracturing caused by nickel sulphide inclusions.

Glass thicknesses

The loading that a balustrade must be designed to resist is determined by the proposed occupancy of a building and the requirements of BS 6399 and BS 6180.

Acceptable glass thicknesses for particular applications are shown below:

Framless Balustrades

Framed Balustrades
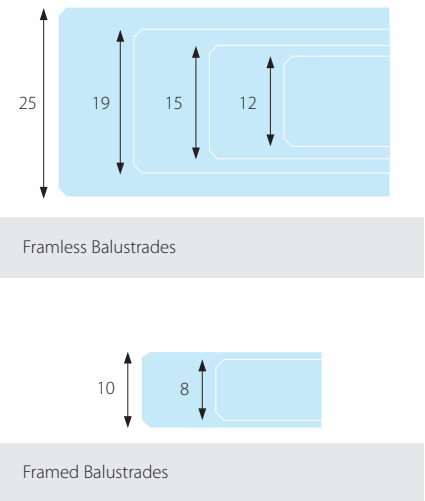
Glass information tables

Framed balustrades - acceptable glass thicknesses

Building use/occupancy	Horizontal uniformly distributed load	Glass thickness
Inside a single family dwelling including stairs, light wells, etc, but excluding balconies/roofs.	0.36kN/m	8mm
Residential balconies/roofs, offices/work areas or institutional buildings not susceptible to overcrowding.	0.74kN/m	10mm
Retail environments or areas susceptible to overcrowding where there is less than 3m width for people to congregate.	1.5kN/m	10mm
Shopping malls, assembly areas or areas susceptible to over-crowding where there is over 3m width for people to congregate.	3.0kN/m	10mm

Framless structural glass - acceptable glass thicknesses

Building Type	Loading	Min thickness of toughened glass	Min thickness of laminated toughened glass
Domestic – internal areas only	0.36kN/m	12mm (Can feel flexible)	13.5mm (6+6+1.5 interlayer)
Commercial/ External Domestic Areas	0.74kN/m	15mm	17.5mm (8+8+1.5 interlayer)
Retail/Public Areas Schools	1.5kN/m	19mm	21.5mm (10+10+1.5 interlayer)
Crowded Areas e.g. Stadia and Shopping Malls	3.0kN/m	25mm	31.5mm (15+15+1.5 interlayer)

Tip: Thicknesses shown are typical and may vary depending on panel size.
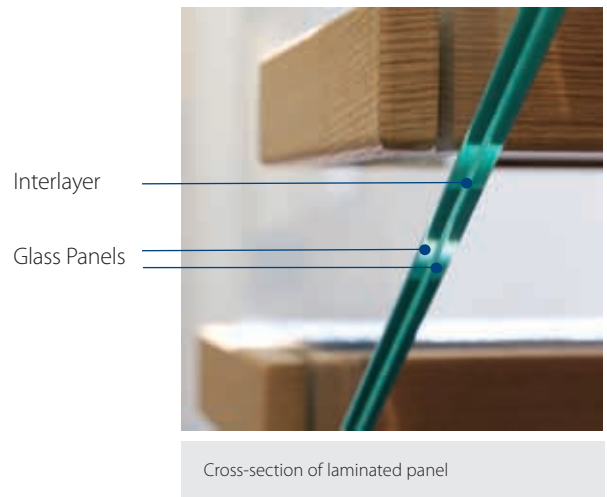
Why laminate?

Laminate glass is typically used for two reasons:

1 > To enhance the safety of the glass
2 > To avoid the need for a handrail

This offers the ultimate in panel security. Two layers of toughened glass are joined with an interlayer. Even if one panel should break, security is preserved by the remaining panel until a full replacement can be made.

Please note: It is essential that the glass used when laminating is toughened glass not standard float (untoughened) glass.

Interlayer

Glass Panels

Cross-section of laminated panel

Laminated toughened glass

Laminated glass is recommended where higher levels of safety or security are required. The lamination and interlayer does not affect the transparency of the glass, but the interlayer can incorporate a wide range of tints, colours, patterns and textures if required. Sapphire recommends the use of a capping with large units of laminated glass as panels can occasionally be mis-aligned leaving unsightly edges. Mis-aligned panels may still be within the lenient regulatory requirements relating to this.

13.5

17.5

21.5

25.5

33

Framless Balustrades

Glass treads and floors
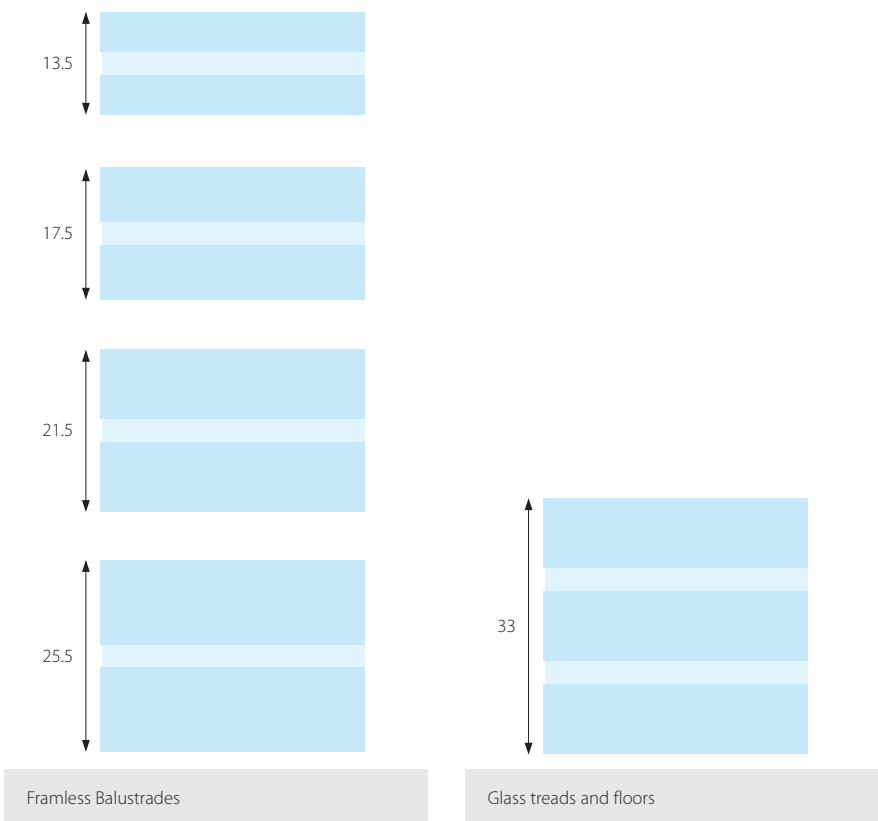
There are three common types of interlayer:

PVB (Poly Vinyl Butyral) is the most common type and is suitable for most applications. This is the solution normally recommended by Sapphire.

SGP (SentryGlas Plus, a registered trade mark of DuPont) could be specified for exposed or potentially 'dangerous' environments; an SGP interlayer may be up to 5 times stronger than a PVB interlayer.

CIP (Cast In Place) is not a laminated interlayer sheet, but rather is a poured resin. Sapphire does not recommend the use of CIP panels because of the messy edge finish which requires concealing with edge strips.

Aesthetics > Curved effects

Curved glass undoubtedly creates elegant and striking balustrades with high aesthetic appeal. However the specifier should consider the high additional expense, the limitations of radii, and the potential differences of appearance between curved glass and flat glass applied alongside each other.

Sapphire recommends a minimum radius of 100 x the thickness of the glass, e.g. with 6mm thick glass the minimum curve radius should be 600mm.

Minimum Radii - Curved Framed Glass Infills

Glass Thickness	Scenario	Minimum radius with toughened glass
10mm Toughened	0.36kN/m Infill panel	1000mm
15mm Toughened	0.74kN/m Structural glass	1500mm
19mm Toughened	1.5kN/m Structural glass	1900mm

Aesthetics > Curved effects for framed balustrades

Using facetted glass in a framed balustrade

Alternative >
Curved handrail with facetted flat glass infills.

This alternative to curved glass provides a cost effective solution for achieving the curved application, whilst still maintaining good visual appeal.

Aesthetics > Curved effects for framless structural glass

When using frameless glass in a curved application there are 2 alternative options to curving the glass. Both of these options provide a more cost effective solution. Despite the glass being flat, the curved handrail maintains the curved visual appearance of the balustrade.

Alternative 1 > facetted glass with curved offset handrail.

This is Sapphire's recommended alternative.
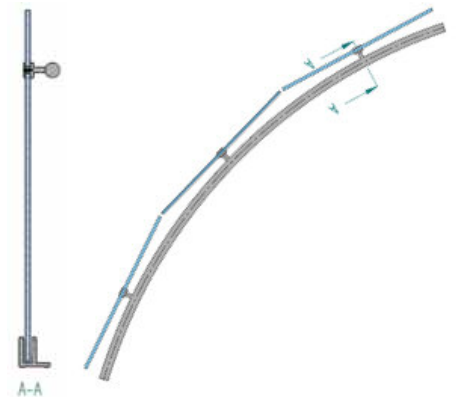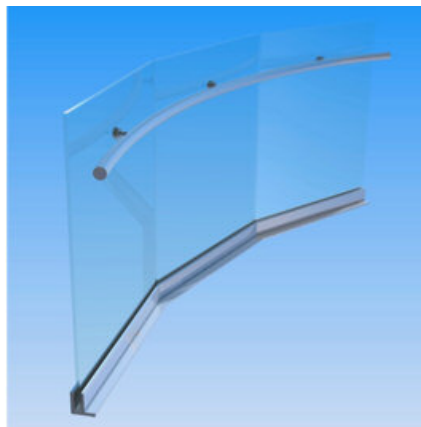
Alternative 2 > facetted glass with wide slot in slotted handrail.

Due to manufacturing complexities this option is best suited to timber (this option is shown in the large image at the top of the page).