AGGA TECHNICAL FACT SHEET

GLASS IN BALUSTRADES FOR CONSUMERS

Introduction

Glass balustrades are ideal for balconies, staircases, pool fences and other applications where the protection of a difference in level is required. Available with minimum framing or even as a free standing system, glass balustrades provide a barrier whilst still permitting uninterrupted views. Used externally, an additional benefit provided by glass balustrades is that of a transparent windbreak.

Design and construction

A balustrade's primarily function is to prevent people from falling from height above the ground, and therefore safety is a key consideration. As such, there are strict requirements for design, construction and installation by a number of different Australian Standards. These Standards set out the requirements for glass and or glazing supports in conjunction with the design loads to simulate environmental conditions related to high wind pressures and human or object impact on the surface or edge of the glass and supports.

The National Construction Code

The National Construction Code of Australia basic balustrade fall height requirement is as follows:

"Any access way or landing area where there is a fall distance of 1 metre or more above the surrounding ground level requires a barrier (Balustrading) to protect people from falling over the edge. The minimum height of a balustrade is 1 metre and if protecting a pool area, access would need to be 1.2 metres."

Glass types in balustrades

All balustrade glazing must be made from Grade A safety glass. If used at higher levels, Grade A laminated safety glass should be considered due its breakage characteristics.

The exact specifications depend on a number of variables, including the balustrade type, location, height above ground level and the loads it will be subjected to, so it is important to choose a supplier who has a good knowledge of AS 1288: Glass in Buildings—Selection and Installation, the Australian Standard which all glass balustrades must comply with.

This in turn results in limitations on the minimum glass thickness that can be used to a maximum allowable size between supports.

In all cases the type of occupancy of the where the balustrade is located also influences the thickness and type of glass required as the number of persons relying on the strength and support of the balustrade may be different in say a shopping centre as compared to a home.

Other than for a single dwelling, any monolithic toughened glass balustrades that are over 5 metres from the surrounding ground level must also be heat soaked.

The common different types of glass permitted for use in balustrades include:

Annealed laminated safety glass

Comprises two pieces of normal glass adhered to a plastic interlayer. When laminated safety glass is broken the shattered pieces tend to remain affixed to the plastic interlayer creating a 'spider web' effect. As long as the impact is not severe enough to pierce or dislodge the glazing, the broken glass tends to remain in place. A minimum thickness of 6mm is permitted for infill panels, 8mm for structural panels (Figure 2) and is not advised for structural cantilever panels (Figure 1).

Monolithic toughened safety glass

Generally four to five times stronger than ordinary glass and in the event of breakage the glass fractures into small harmless fragments and will no longer support a load or act as a barrier. Consequently, toughened glass that is not fully framed is likely to fall from its fixings and would not prevent the penetration of the impacting object (or person) possibly to a level below. A minimum thickness of 6mm is permitted for infill panels, 8mm for structural panels (Figure 2) and 10mm for structural cantilever panels (Figure 1).

Toughened laminated safety glass

A combination of toughened single pieces of glass that have been laminated. The benefit of toughened laminated glass is its strength and performance under impact. It is capable of withstanding large loads and in the event of being broken the resulting fragments will be retained by the interlayer. When properly glazed, it normally will remain in place which enhances safety and security. A minimum thickness of 8mm is permitted for infill panels, 8mm for structural panels (Figure 2) and 10mm for structural cantilever panels (Figure 1).

Figure 1 (Source: www.aaromatfencing.com.au)

Figure 2 (Source: www.mclarenvaleglass.com.au)

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Types of balustrade panels

Glass can form part of a balustrade in two ways.

1) As an Infill Balustrade Panel (Figures 3 & 4) within an outer frame or structure, usually made of aluminium, timber or steel. Can be in several configurations but the balustrade always has a handrail with the glass infill panel being supported either in a channel or mechanically with clamps and bolts. The non-glass handrail must be able to resist the specified applied loads such as persons falling or leaning on or against the hand rail.

Figure 3 (Source: www.weldtech.com.au)

Figure 4 (Source: http://t2.gstatic.com/)

2) As a Structural Balustrade Panel (Figures 1 & 2) where the glass is the main structural component of the balustrade.

The main feature of this type of balustrade is that the glass itself provides structural support for any loads that may be imposed upon it. Unless they are specifically designed by a qualified engineer these types of balustrades are limited to areas where the difference in ground level is 1000mm or less.

Structural balustrades include:

Figure 5 - cantilever type, where the glass is fixed only at the base, either in a channel or mechanically by stub post, bolt fix, or bracket fixing. The glass usually has the remaining three edges exposed and the top edge of the glass is exposed.

Figure 5 - Structural Balustrade A: Non-compliant above 1 metre fall height. (Source: www.elitebalustrades.com.au)

Figure 6 - Top edge of glass is exposed with the glass vertical edge being supported within a channel adhesively or mechanically fixed to the vertical posts or balusters. Sometimes the bottom is also supported but the top edge of the glass is exposed.

Figure 6 - Structural Balustrade B: Non-compliant above 1 metre fall height. (Source: www.eglasame.com)

In both figures 5 & 6 the glass needs to be strong enough to withstand specified impacts and loads such as people leaning or falling against the glass.

Structural balustrades with exposed glass top edges are limited to applications where the difference in level is less than 1000mm.

If the level is greater than 1000mm the panels must include an interlinking handrail joining adjacent panels of at least a 1000mm wide, and/or the building so that if the glass is broken, the handrail will remain in place in accordance with Clause 7.2.3c. of AS1288 Australian Standard. Alternatively the balustrade can be designed as an engineered solution and specific consultation is required with a suitably qualified person. This is usually a qualified engineer with glass design experience.

Balustrade regulations indicate that the barriers should be constructed in such a way that a person will not fall over or slip through them. This requires that the height of the balustrade and the spaces between each post should be designed properly. In terms of structural adequacy, the barrier or balustrade should have enough strength not to collapse when a person leans or falls against it or is subject to a sudden strong impact. The AS1288 -2006 standard deals with:

- Structural balustrades, protecting a difference in level less than 1000mm.
- Structural balustrades, protecting a difference in level greater than 1000mm with an interlinking handrail
- Infill balustrades, protecting any difference in level

The difference in level is measured from the ground or floor surface at the base of the baluster or the visible glass site line on a cantilever panel. There are minimum glass thicknesses that can be used in balustrades and each have size limitations dependant on individual site conditions related to type of handrail, occupancy or level to be protected in combination with method of glazing and loads applicable to the glass. Consideration should be given to the type of glass used and their basic properties especially its use at high level because if it is broken it may no longer support a load or act as a barrier.

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