Cantilevered glass

design elements

arden
ARCHITECTURAL STAIRCASES
The F0 cantilevered glass design allows boundaries to be defined with minimal interruption to the visual aesthetics of a build. Because the design does not incorporate vertical stanchion components, the strong horizontal lines of the handrail are emphasised, often increasing the sense of perspective and space.

The F0 is framed only by a bottom structural glazing channel, and cantilevers vertically to support a handrail. Most handrail profiles can work with the F0, and may be supported by through-glass patch fittings or directly by the top edge of the glass. However, in most projects, a timber rectangular or circular profile handrail supported by the top edge of the glass generally provides the most effective visual impact.

To achieve a supported interlinking handrail for F0, stanchions are sometimes required at the termination of balustrade runs. A variety of stanchion designs can be applied, but a continuation of the handrail itself via a 90 degree turn often provides the most satisfactory result.
Figure 1. Void edge balustrade front elevation. F0 presents an extremely clean and minimal front aspect, making it suitable for situations when it is desired to reduce distraction to surrounding elements or to maximise the sense of space and light.

Figure 2. Side elevation incorporating fixing to suit a thick concrete slab and heavy rectangular handrail detail.

Figure 3. Heavy rectangular handrail detail. A weighty timber handrail profile often works well with large scale cantilevered glass panels.

Figure 4. Typical fixing detail to thick concrete slab. Appropriate engineering of cantilevered glass support is critical to ensure that specified design loads are met. Arden may vary fixing details to address specific site properties.

*Indicated on dimensions denotes a nominal dimension that typically varies according to specific application, engineering requirements or client preferences.*
technical

Cantilevered glass using channel and grout to form the cantilever is a neat alternative to patch fittings and provides some clear advantages over patch fittings.

The advantages include:

a) A continuous support to the base of the glass panel (as opposed to a point load as is the case when using patch fittings)

b) Saving in overall depth required to form the cantilever – patch fittings require edge clearances to the bottom of the glass as well as sufficient separation to form the cantilever. Typically a grouted cantilever requires less vertical space

c) The structural installation or formation of the grouting channel typically requires a lesser accuracy for install, with the final glass installation then fine-tuned to an exact position during the grouting process.

d) Most grouted applications allow for the channel and grout to be hidden behind other finishes (e.g. floor tiles, capping, etc) and results in the design effect of the glass simply rising out of the structure, providing a finished, clean and un-cluttered look.

It should be noted that effective design of the channel and grout cantilevered glass involves due consideration being made for the finishes that cover the grouted channel and finish against the glass.
structural glass panels

This table shows typical glass specifications (for nominal handrail height of 1m) depending on design load.

<table>
<thead>
<tr>
<th>Design load</th>
<th>Toughened monolithic safety glass (mm)</th>
<th>Toughened laminated safety glass (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Domestic/Residential</td>
<td>Std</td>
<td>On request</td>
</tr>
<tr>
<td>Offices/Commercial stairs</td>
<td>Min</td>
<td>Std</td>
</tr>
<tr>
<td>Retail/Restaurant</td>
<td>N/A</td>
<td>Std</td>
</tr>
<tr>
<td>C5 high loads</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes
1. These tables are to be used as a general design guide only.
2. Individual project requirements will dictate final glass specification and thickness.
3. All spans nominated are indicative of normal internal conditions. In some exposed situations, wind loads may exceed design load and thicker glass or smaller spans may be required.
design standards for glass panels

Glass balustrade panels must satisfy engineering requirements as specified in AS1288, and the Arden balustrade styles shown here are defined and specified with regard to the relevant design standards.

Of particular importance in the initial design stage, it is critical to maintain an awareness of the designation of glass panels as structural or infill, and the classification of handrail as load-supporting, non-load-supporting, or interlinking. Combined with other considerations (e.g. whether or not mechanical point-fixings are specified, span is cantilevered or supported on both sides), this determines the grade of glass (e.g. laminated annealed, toughened safety, laminated toughened) and type of handrail that satisfies the code.

As in other aspects of stair and balustrade design, Arden will advise with respect to the practicability of preliminary designs with respect to Australian standards.

glass balustrade styles

**Cantilevered structural.** Glass panels supporting an interlinking handrail cantilever from an appropriate floor fixing.

**Fully framed.** Glass panels are provided with four-edge support and are therefore rated as infill only.

**Two-edge clasp.** Glass panels are supported on two opposite edges by clasp-style mechanical fixings. The bearing of point loads influence the required grade of glass. Stanchions may be located between, or at intermediate locations within, each panel span.

**Semi-framed vertical channel.** Glass panels are fixed via proprietary or custom channel system on each side.

**Two-side patch-fitting.** Glass panels are supported on two opposite sides by through-glass mechanical fixings. The bearing of point loads influence the required grade of glass. Stanchions may be located between, or at intermediate locations within, each panel span.

**Semi-framed lateral channel.** Glass panels are fixed via proprietary or custom channel system on the bottom rail and underside of handrail.

**Hybrid.** Glass panels are provided with a combination of the above methods so as to comply with safety requirements.

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*Figure 7. Alternative termination detail for 50mm round handrail version. Round handrail is connected to custom full height stainless steel stanchion ex 50x12 flat-bar. Both termination styles (as shown in this diagram and the one preceding) present a very elegant and refined finish.*
compliance

Arden is a BSA licensed contractor for carpentry, joinery, glass, glazing and aluminium as well as structural metal fabrication and erection. Arden supplies a Form 16 (Licensed Contractor) on all projects. In design and construct contracts, a Form 15 (Design Engineer) certification is supplied upon request. For products and services incorporating the FO system, this table shows compliance with relevant codes and standards.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCA</td>
<td>The Building Code of Australia</td>
<td></td>
</tr>
<tr>
<td>AS NZS 1170.1-2002</td>
<td>Structural Design Actions – Permanent, imposed and other actions</td>
<td></td>
</tr>
<tr>
<td>AS NZS 1554.1-2004</td>
<td>Structural steel welding - Welding of steel structures</td>
<td></td>
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<tr>
<td>AS 1554.6-1994</td>
<td>Welding stainless steels for structural purposes</td>
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<tr>
<td>AS NZS 4586-2004</td>
<td>Slip resistance classification of new pedestrian surface materials</td>
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<tr>
<td>AS 1428.1-2009</td>
<td>Design for access and mobility</td>
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**Key**
- 🌟 full compliance with the code
- ○ not applicable to this element

design note

For all commercial applications, it is important that sufficient space for the stairwell cavity be allowed to satisfy Australian Standards and BCA requirements.

The footprint is primarily driven by the floor to floor rise, as well as the staircase configuration chosen. However, stringer and balustrade style design may increase the amount of space required. Allowing too small a cavity can restrict the design options of the staircase. Also, points at where the staircase interacts with other structures are best addressed early in the design cycle.

Consultation with Arden early on will help ensure that these design issues can be addressed in a cost-effective manner.