

CROSS Safety Report

Dangerous glass infill panels on balustrade

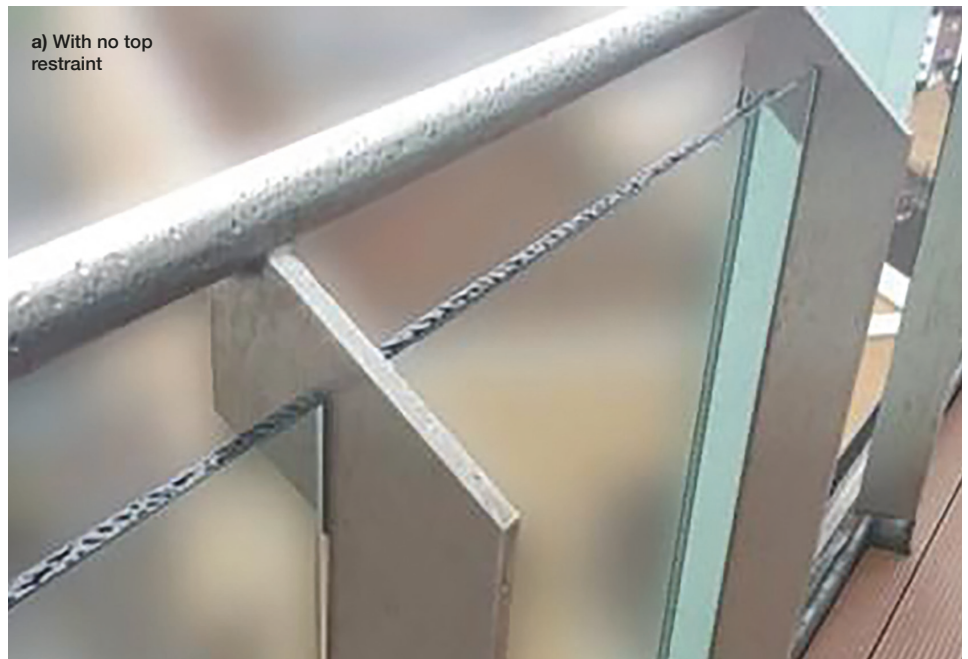
This month we present a report about the structural stability of cantilever glass infill panels between a steel post and handrail balustrade system at a high-level apartment block.

Report

A reporter expressed the following concerns about the structural stability of cantilever glass infill panels between a steel post and handrail balustrade system at a high-level apartment block:

- | The glass infill panels are set into a mastic filled channel at the base which in places is deteriorating.
- | Some infill panels are laminated, and some are non-laminated.
- | The steel post and handrail balustrade system is not connected to the glass infill panels.

According to the reporter, in the event of a failure at the base, there is no secondary fixity to prevent complete failure of the glass sheet (**Figure 1a**). The height of the apartment means that patio furniture can get blown right round three sides of the block of flats by wind. In the event of impact from the furniture, the non-laminated glass could shatter.

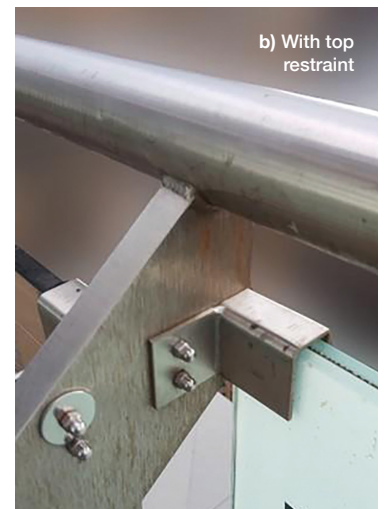


Key learning outcomes

For civil and structural design engineers:

- | Where specialist systems such as glass infill panels are used, it is beneficial to have a close working relationship with the supplier from the earliest opportunity to ensure design requirements are met
- | Glazing design is often carried out by a specialist contractor. If the glazing is to withstand horizontal loading this requirement should be conveyed to the contractor
- | Careful consideration should be given to cantilever glass barriers to ensure they are adequately fixed at the base
- | If you are involved in the design of balustrades / barriers with glass infill panels, it is good practice to consult:
 1. The Centre for Window and Cladding (CWCT) standards and guidelines for glazing
 2. The Construction Industry Research and Information Association (CIRIA) *Guidance on glazing at height* (C632F)

FIGURE 1:
Glass infill panel





SMALL CHANGES TO THE DESIGN WOULD HAVE RESULTED IN A MUCH SAFER SCENARIO AND SUBSTANTIALLY REDUCED THE RISK

Remedial works on glass infill panels

The reporter feels that all the non-laminated sheets of glass need to be replaced with laminated glass. They feel a secondary top fixing bar in stainless steel should be added to exploit the existing post and rail system. This would hold the top of all the glass sheets given what appears to be the deterioration of the single base fixing. Remedial work was undertaken to fix the top edges of the glass sheets to the posts, on flats with the same detail (Figure 1b).

Expert Panel comments

Safety at height is a major concern and should always be in the forefront of the mind of a designer of external components in tall structures.

Here, the glass simply cantilevers from a mastic filled channel at the base, which is not a robust detail, and does not provide safety either for residents or passers-by.

Safety concerns of glass cantilever panels

Cantilevers always require care and glass cantilevers particularly so. The risk is that if the glass breaks from impact then; firstly, there would be a large gap below the balustrade rail through which someone could fall and, secondly glass shards or granules could fall on the ground below. Another possibility would be that a panel was dislodged outwards, without breaking, but with the same consequences.

Industry guidance on glazing

Small changes to the design would have resulted in a much safer scenario and substantially reduced the risk. The usual procedure for a designer would be to consult the Centre for Windows and Cladding Technology (CWCT) standards and guidelines for glazing, and the Construction Industry Research and Information Association (CIRIA) *Guide to Glazing at Height C632F*.

Glass is a specialist material that fails in a sudden fashion and any

bespoke application should always be designed by someone with appropriate knowledge and experience. There should be discussion at the design stage to satisfy the requirements of CDM Regulations 2015 and to deal with residual risks.

There are a number of CROSS reports about balconies and glazing (see **Further reading**).

The full report, including links to guidance mentioned, is available on the CROSS website (report ID: 741) at www.cross-safety.org/uk/safety-information/cross-safety-report/dangerous-glass-infill-panels-balustrade-741.

What is CROSS?

Collaborative Reporting for Safer Structures (CROSS) helps professionals to make structures safer by publishing safety information based on the reports it receives and information in the public domain.

CROSS operates internationally in the UK, US, and Australasia. All regions cover structural safety, while CROSS-UK also covers fire safety.



How reporting to CROSS works

The secure and confidential safety reporting system allows professionals to share their experiences to help others.

Professionals can submit reports on safety issues related to buildings and other structures in the built environment. Reports typically relate to concerns, near misses or incidents. Find out more, including how to submit a safety report, at <https://bit.ly/cross-safety>. Your report will make a difference.



Further reading

CROSS-UK Safety Reports and Alerts

- | *Safety Alert: Structural safety of glass in balustrades*
- | *Glass panel fixings failure* – Report ID: 182
- | *Modifications to balustrades in a shopping centre* – Report ID: 336
- | *Nuts falling from tension glazing system* – Report ID: 340
- | *Glass panel blown out by wind in city centre* – Report ID: 535
- | *Dangerously defective glass smoke screens* – Report ID: 734
- | *Inadequate design of cantilever glass barriers* – Report ID: 735
- | *Collapse of domestic glass balustrade due to inadequate fixings* – Report ID: 756
- | *Collapse of glass balustrade from staircase in public building* – Report ID: 782
- | *Fixing brackets for glazing systems* – Report ID: 802
- | *Glazing design and horizontal barrier loading* – Report ID: 899
- | *Glass removal from facades* – Report ID: 988
- | *Toughened glass failures* – Report ID: 1135

Access the above CROSS Safety Reports at www.cross-safety.org/uk.

CROSS-AUS Safety Reports

- | *Sliding glass door – two-part subhead failure* – Report ID: 818
- | *High rise balustrade design* – Report ID: 938

Access the above CROSS Safety Reports at www.cross-safety.org/aus.