New Safety Railing Rigorous Testing Procedure

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Safety railings are an essential and often life-saving feature of living and working in high-rise buildings. They enable occupants to safely use verandahs, decks, atriums, and rooftops without fear of mishap. Notwithstanding this, we regularly hear of accidents involving serious falls from heights, including people who have either fallen through or over a safety railing. Clearly, safety railings are an important feature of the risk management profile of any multi-storied building.

NSW Construction priority area

- 18 fatalities in Australia 2003
- 7 fatalities in 2003 in NSW
- 2 already in 2004 in NSW
- Finishing and fit out trades most likely to fall.

'Briefing provided by Worksafe Victoria to participants in the National Falls from Heights Campaign'

Recently it has become fashionable to use railings with glass in-fill panels instead of standard railings with a mid-rail. They are aesthetically more pleasing to the eye. But are they safe? and do they comply with Australian Safety Standards?

High rise building with glass infill safety railings

These questions confronted the Physical Testing Branch at TestSafe when a client submitted a prototype railing (with glass-panelled infill) for testing. Standard railings, with their in-built mid-rails have been tested at the site for many years. However, TestSafe had never conducted tests on such a railing prior to this. The challenge was to determine which standard would be appropriate as a testing procedure.

Interestingly this dilemma was overcome by using a combination of 9 tests utilising the relevant provisions of Australian Standards 1657 of 1992, "Fixed Platforms, Walkways, Stairways, and Ladders - Design Construction and Installation", and "AS1170 of 1989, Part 1, Dead and Live Loads and Load Combinations". Senior Technical Officer, Laurie Gerisch tested not only the strength of the glass infill panel, but also the top railing and the side posts. Mirroring a typical glass infill panel, he set the rail length at 1100mm and used aluminium alloy material for the frame.

Tests were conducted for both the horizontal and vertical distributed load to the top rail. These were uniform tests using a load of 0.75kN/m or around 84kg. A further test was focused upon the point load of the top rail with an applied force of 0.6kN or 1.2kg. The frame used for these tests was cemented into concrete and these results were designed to illustrate the high level of stability of the frame that supported the glass panel infill.

Further distributed and point load tests were also conducted on the glass panel itself. In the distributed load test a force of 840N or around 86kg was applied. With zero set at +15mm, a deflection of 11.8mm at full load was noted. After 15minutes at full load, the natural deflection was up to 12.0mm. After the load was removed, the deflection was at a mere 14.7mm, resulting in a permanent set of 0.3mm.

Laurie Gerisch testing glass railing at TestSafe.

The point load test applied a force to the middle of the panel of 0.5kN or around 51kg. With the initial deflection at 12.3mm increasing slightly to 12.4mm after being held for 15 minutes, the glass moved back to 0.15mm after the load was removed.

Positive safety results were achieved from the tests conducted on the frames while they were set in concrete, but the reality is that many railing posts are actually bolted into high-rise buildings rather than cemented. This meant that the testing officer had to modify the procedure to include this variable, with the utilization of flange bolted side posts, using dynabolts 8mm in size, as a contrast to the cemented posts. The flange bolted posts were found to be less sturdy than those that were cemented. This was explicitly illustrated in the two bolt tests. The differences between the two respective tests were quite substantial. With zero set at 30mm for both tests, a load of 0.758kN or around 77kg was held for 15 minutes. The first test had a deflection result of 27.2mm. With the residual load removed the deflection was set at 2.3mm. This contrasts with the second test, which had much more dramatic results. The same load held for 15 minutes recorded a deflection of 24.7mm, which was significantly less than the first test, and a result of 0.8mm within 30mins after the load was removed. The flange bolted posts however, still gave a positive indication of safety.

Currently, testing of glass infill railings is uncommon, but the likelihood of future requests to TestSafe to conduct tests on similar models, seems inevitable. With glass infill railings becoming more and more fashionable, especially in apartment complexes, and the underlying imperative to acquire accredited safety certification, TestSafe has been able to create a new set of procedures for testing the safety of these glass infill railings.