

CROSS Safety Report

Cladding failure in strong winds

This month we present a report expressing concerns about a repeat failure of building cladding, in severe but not exceptional winds, that saw panels fall to the public street below.

Report

A reporter writes with concerns about a repeated failure of modern cladding in severe but not exceptional winds that caused a hazard to public safety. Large, lightweight aluminium panels fell from a building onto the public street below. Fortunately, no one was injured, but the incident could have easily been more serious.

Errors in the design and/or construction of the cladding works were found during investigation survey work, says the reporter. The sheeting had been previously repaired, but the severity of the inherent weaknesses in the installation was apparently not recognised or remedied during the previous repairs.

The section of cladding which failed showed evidence of having been refixed. Some failed fixing points showed signs of multiple drill holes or enlarged drill holes. Loose or incorrectly installed fixings were observed in other parts of the remaining cladding. The reporter believes the absence of a complete continuous cladding support system may have contributed to the failure. Many panel edges and joints were observed as unsupported, including near a corner. The reporter recommended a replacement cladding support system as part of the required remedial works.

The reporter goes on to say that the poor installation of the cladding, its restraints and the fixings likely resulted from a lack of expertise applied during the construction process. Furthermore, the reporter believes there must have been an absence of suitably experienced supervision during the works for the installation to exist as found.

The reporter also suspects gaps in the design knowledge of the original specifier of the cladding, gaps in the contractor's knowledge, and that conditions of the construction contract could have impacted what was originally built. The reporter concluded that thorough attention should be given to the detailing and supervision of cladding works.

Expert Panel comments

This report highlights several concerning issues, including design, specification, procurement, installation, and construction supervision, all of which can cause, or contribute to, failure of cladding systems.

An issue with cladding is that there is often not one person responsible for the overall design of the system. The sheets may be specified by one designer, with primary and secondary steelwork

designed by another. Supposedly minor elements such as cladding rails, say at corners, edges and openings, may be specified (but perhaps not designed) by the cladding contractor, with the responsibility to consider fixings varying across projects.

Such fragmentation of responsibilities leads to design interfaces where risk can thrive. Where design is fragmented, the responsibilities of each designer should be clearly defined, with one designer taking the lead to ensure all interfaces are considered. Care should be taken to ensure procurement processes do not prejudice coherent design interfaces.

It is essential that all elements of the cladding system are adequately detailed on construction issue drawings, and that these drawings, regardless of the different suppliers, provide coherent instructions for site fixing. In the case reported here, it is clear that panel edges and joints were found to be unsupported, which should not happen.

The failure reported here occurred under severe but not exceptional wind conditions. There is sometimes not enough understanding of the disproportionately large wind loads that occur at the sharp edges of buildings and roofs, and at the edges of cladding panels, all of which need to be adequately fixed and restrained.

Designers should ensure robust designs, with key areas of installation highlighted to ensure safe designs. CROSS recommends that cladding design and installation is given the same degree of attention as the primary structure during both design and construction to improve safety, reliability and longevity.

Fixings are critical

Clearly, appropriate fixings must be

Key learning outcomes

For architects, engineers, and other cladding specifiers:

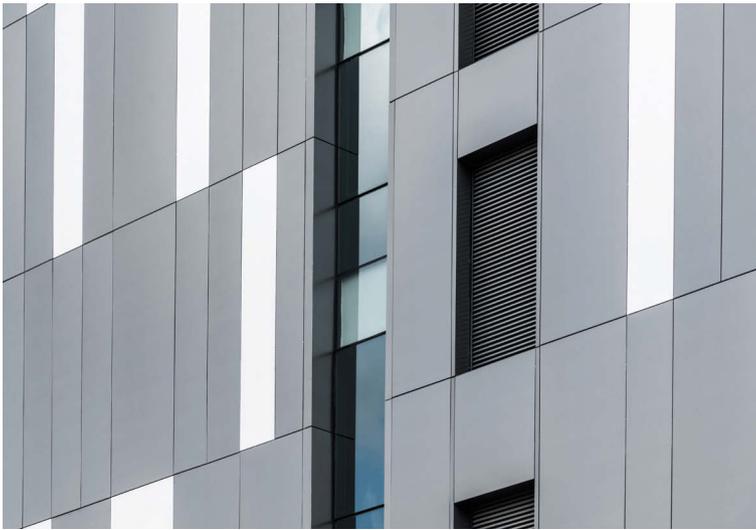
- | Cladding design and installation should be given the same degree of attention as the primary structure to improve safety, reliability, and longevity
- | Design responsibilities for the whole cladding system should be clearly defined
- | Consider the inspection and test plans required to demonstrate the adequacy of fixed cladding

For civil and structural design engineers:

- | Select the correct fixings for the given loads and environment
- | Design with robustness in mind
- | If possible, attend site to inspect the installation of cladding systems and their fixings

For construction professionals including cladding contractors:

- | Adequate quality assurance and competent supervision can help to ensure that cladding systems are installed in accordance with the design



“ THE ABSENCE OF A COMPLETE CONTINUOUS CLADDING SUPPORT SYSTEM MAY HAVE CONTRIBUTED TO THE FAILURE

designed and specified. Fasteners must be fixed in accordance with the manufacturer's requirements, including with the correct equipment to ensure that adequate fixings are achieved. Fixings can vibrate loose and it is impossible to predict the air pressure fluctuations that cause this. The correct choice of fixing can ensure that fixings do not loosen through wind or vibration-induced effects.

There can be numerous problems with self-tapping fixings into cold rolled sections. One issue is that the pull-out value is very sensitive to even very minor changes in rail metal thickness. So much so that on some designs the cladding rails need to be chosen not for their overall bending capacity, but for the metal thickness to assure adequate fixing pull-out. Care is also required where countersunk fixings are proposed, as countersinking can significantly reduce the capacity of fixings.

In all cases, fixing design should be done by a specialist to ensure sufficient redundancy, longevity and compatibility. The CROSS report, *Metal cladding panels fail and fall to ground*, published in 2022 concerned the failure and detachment from a building of metal panels. The report considered issues of design, manufacture and fixing of sheeting, including the need for vibration-resistant fasteners. The

Construction Fixings Association provides guidance for the design and execution of fixings. Significant attention to all aspects of fixings is required.

Correct site fixing of sheeting must be assured. Marking out of site fixings must accord with the design to ensure that minimum edge distances and the like are achieved. Quality control procedures should demonstrate that the installation meets the cladding system specification, which sets down materials, workmanship and testing requirements.

It is essential that there is adequate supervision of subcontractor activities to ensure the satisfactory execution of works. Arrangements for the inspection and acceptance, including inspection and testing plans, of subcontractor packages should be carefully considered and agreed upon. The demonstration of the adequacy of concealed fixings requires particular thought. Consideration should be given to the provision of independent supervision for all aspects of the construction process where safety-critical fixings are concerned.

The full report, including links to guidance mentioned, is available on the CROSS website (report ID: 1172) at www.cross-safety.org/uk/safety-information/cross-safety-report/cladding-failure-strong-winds-1172.

← A number of different subcontractors are involved in the installation and fixing of cladding.

Further reading

Institution of Structural Engineers (2020) *Structural aspects of cladding*, London: IStructE Ltd

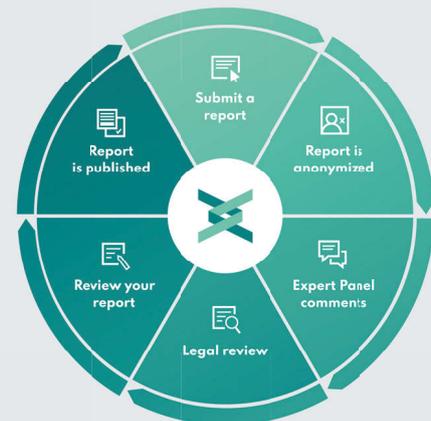
Harrison P., Masat J. and Peric-Matthews A. (2000) *C524: Cladding fixings*, London: CIRIA

Heywood M.D. (2006) *P346: Best practice for the specification and installation of metal cladding and secondary steelwork*, Ascot: SCI

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.

