

CROSS Safety Report

Water ingress to cross-laminated timber structural frame

This month we present a CROSS report concerning water ingress causing parts of the cross-laminated timber (CLT) structural frame of an eight-year-old building to rot.

Report

A reporter had been involved with remedial works on a project that was built about eight years previously and included cross-laminated timber (CLT). The external walls had insulation covering CLT panels and it was found that due to quality issues with the original wall construction, there had been water penetration which caused parts of the CLT to rot in localised areas.

This was a serious concern because the rot was hidden behind the insulation and so was only identified when significant amounts of intrusive investigations into the external wall construction were carried out. Visual

inspection from outside the building would not have identified this issue. This means that if the investigations had not been carried out, over a longer time period (e.g. 10 to 20 years) the rot might well have become much more extensive.

When CLT is used it typically forms the structural frame and so there is a risk that poor waterproofing could cause the frame to deteriorate over time with no outward sign of the deterioration. The reporter considered the cause of the water ingress was likely poor workmanship, poor design, or a combination of both.

For new buildings that include CLT, says the reporter, it is vital to emphasise the importance of effective waterproofing through good design and construction. It is much more important for a CLT building than it would be for buildings with more conventional types of structure, for example, reinforced concrete.

The reporter considers that for existing buildings that include CLT, the owners and anyone surveying them, should be aware of this issue and ensure that adequate checks are carried out, although in practice it is a difficult issue to investigate without extensive intrusive investigations.

Expert Panel comments

This report highlights the importance of understanding a structure, and knowing where there are hidden critical components. Where unseen deterioration could lead to a failure and components cannot be inspected then 'beware'.

A theme that occurs in many CROSS reports is 'inspectability'. The object of an inspection is to detect a problem before it progresses far enough to become structurally dangerous. In this case, it looks as if there was no way of knowing that the timber was rotting. With a trend for increasingly greater use of CLT in buildings, including tall buildings, it is critical to ensure protection of susceptible materials from water and from other potential hazards.

Unfortunately, poor detailing which allows water ingress can badly affect all building types, causing failures in different ways including providing environments that are damp and hazardous to health. These issues are often difficult and expensive to resolve. CROSS report *Rotting of cross-laminated timber (CLT) roof panels* published in 2019 similarly concerned hidden structural members which had deteriorated due to an ingress of water. This report also considered the subject of internally generated condensation in buildings which can be really problematic and again lead to deterioration of structural elements including timber as well as causing all manner of unacceptable non-structural effects. BS 5250:2021 gives recommendations and guidance on avoiding problems with high moisture levels and condensation in buildings.

Water and moisture generally are contributing factors to much

Key learning outcomes

For construction professionals:

- | Design in 'inspectability' of key building components including structure
- | Be aware of the risks associated with moisture build-up, particularly where timber is a main component
- | Good detailing can be key to controlling water ingress
- | Beware of the potential for condensation within external walls
- | Ventilation requirements must be considered to control condensation in buildings

For contractors:

- | Consider the knowledge and experience required to sign-off compliance of specialist packages such as CLT



SHUTTERSTOCK / FLYSTOCK

With a trend for greater use of CLT, it is important to ensure protection from water and other hazards

“ GOOD DETAILING AND CONSTRUCTION OF WEATHERPROOFING SYSTEMS ARE ESSENTIAL

deterioration and failure of buildings. Good detailing and construction of weatherproofing systems are essential. A lack of routine maintenance may also play a part and lead to deterioration.

Deterioration can contribute to the collapse of structures. The ice rink roof collapsed onto skaters in Bad Reichenhall, Bavaria, Germany, in 2006 killing 15 people. There was not a single cause of the collapse but a series of several defects and damage. The design capacity of the failed elements

was found to be inadequate and this capacity was further reduced over the life of the structure due to deterioration in the timber box girders. The structure was about 34 years old at collapse.

The full report, including links to guidance mentioned, is available on the CROSS website (report ID: 1124) at www.cross-safety.org/uk/safety-information/cross-safety-report/water-ingress-cross-laminated-timber-structural-frame-1124.

Further reading

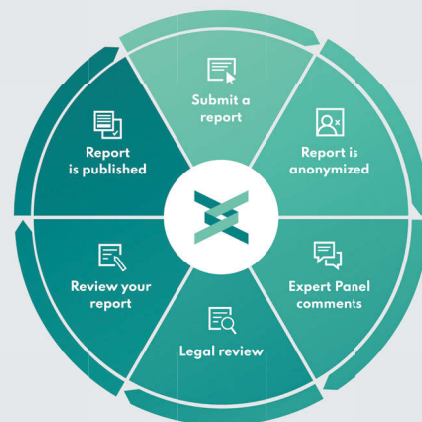
CROSS-UK (2021) *Cross-laminated timber (CLT) in multi-storey buildings* [Online] Available at: www.cross-safety.org/uk/safety-information/cross-feature-article/cross-laminated-timber-clt-multi-storey-buildings (Accessed: April 2023)

Hewlett B. (2021) 'A checklist of water damage', *Proc. ICE Forensic Eng.*, 174 (2), pp. 35–43; <https://doi.org/10.1680/jfoen.20.00024>

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.



SCAN ME

