

# Confidential Reporting on Structural Safety (CROSS): newsletter 54



In this article, we highlight a report from CROSS newsletter 54, on temporary stability in a steel-framed building.

## 789: Temporary stability of steel-framed building

### Report

This event concerns the temporary stability of a four-storey steel-framed structure with precast concrete planks and a structural topping. A reporter says that during the erection of the structure, the contractor had provided temporary steel bracing to a number of the bays to stabilise the structure and prevent it from swaying. The bracing was in the form of flat steel plates arranged diagonally.

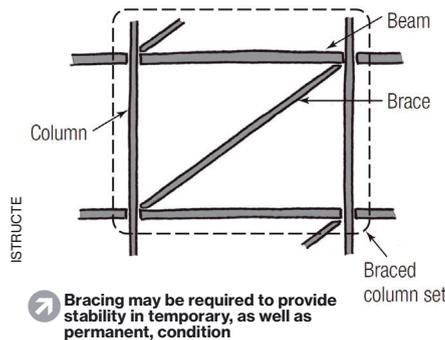
While attending site, the visiting structural engineer found one of the bracing members unbolted at the base of a column. The column which the bracing should have been fixed to was located at the perimeter of the building where the outside ground level was lower than the internal slab level. To protect operatives from falls, edge protection had been provided. But when installing the edge protection, the bracing had been unbolted.

The situation was plainly unsafe and indicated both a disregard for safety by the operative who unbolted the bracing and a lack of control, supervision and oversight from the main contractor.

For the same project, several concerns were found about the temporary works design for the temporary stability of the frame:

1) During the project, the engineer had communicated that until the concrete planks were grouted together, the diaphragm for distributing the lateral loads should be assumed to be incomplete. The implication of this was that the stability of the structure was the responsibility of the contractor until the diaphragm was complete.

The steel frame subcontractor was responsible for both the erection of the steel



frame and the landing of the precast concrete planks. While they were willing to take on design responsibility for the temporary stability of the steel frame without planks, they passed on design responsibility for the steel frame when the precast planks had been landed to the main contractor.

This division of responsibility was unexpected and led to confusion between the two temporary works designers, with the steel frame subcontractor using moment fixity from the beam end-plate connections and the main contractor assuming perfectly pinned beam-column connections that required cross-bracing. The latter approach eventually proved to be very conservative and had to be revised to be cost-effective.

2) When the main contractor began the temporary stability design for the steel frame with concrete planks, they requested to see the calculations that had been completed by the steel frame subcontractor for the frame without planks. Stability was justified

based on the moment capacity of the end-plate connections and, while this principle was sensible, there were no accompanying calculations. The structural engineer deemed this was insufficient to demonstrate that the frame would be stable during construction.

There are, says the reporter, two lessons learned from the above experiences. The first is that temporary works designers for main contractors may not have adequate experience to undertake the temporary works design for the stability of a steel frame. Given the size of the structure, the lack of calculation initially provided by the steel subcontractor was also of concern and may be indicative of a more widespread problem within the industry.

The second lesson is that splitting design responsibility for temporary works inevitability provides opportunity for confusion, but thankfully did not endanger safety in this case.

### CROSS Panel comments

Structural-Safety has always advocated that there should always be one designer with overall responsibility for stability. While this normally applies to preserving stability of the finished structure, the principle ought equally to apply during construction when arguably the risk of an instability failure is highest.

Regulation 13 of CDM 2015 ultimately places the duty on the Principal Contractor to plan, manage and monitor the construction phase and coordinate matters relating to health and safety during the construction phase to ensure that, so far as is reasonably

### REFERENCES

- ▶ 1) Structural Safety (2017) *SCOSS Alert: Inquiry into the construction of Edinburgh Schools* [Online] Available at: [www.structural-safety.org/media/397456/scoss-alert-inquiry-into-the-construction-of-edinburgh-schools-final-20-february-.pdf](http://www.structural-safety.org/media/397456/scoss-alert-inquiry-into-the-construction-of-edinburgh-schools-final-20-february-.pdf) (Accessed: April 2019)
- ▶ 2) Hackitt J. (2018) *Building a Safer Future: Independent Review of Building Regulations and Fire Safety: final report* [Online] Available at: [www.gov.uk/government/publications/independent-review-of-building-regulations-and-fire-safety-final-report](http://www.gov.uk/government/publications/independent-review-of-building-regulations-and-fire-safety-final-report) (Accessed: April 2019)
- ▶ 3) British Standards Institution (2008) *BS 5975:2008+A1:2011 Code of practice for temporary works procedures and the permissible stress design of falsework*, London: BSI
- ▶ 4) British Standards Institution (2017) *PAS 8811:2017 Temporary works. Major infrastructure client procedures. Code of practice*, London: BSI
- ▶ 5) Temporary Works Forum website (2019) [Online] Available at: [www.twforum.org.uk/home](http://www.twforum.org.uk/home) (Accessed: April 2019)
- ▶ 6) British Constructional Steel Association (2006) *Publication 42/06: Guide to the Erection of Multi-Storey Buildings*, London: BCSA

practicable, construction work is carried out without risks to health or safety. In all situations, the Principal Contractor's Temporary Works Coordinator (TWC) (or Contractor's if a small job) should have oversight of maintaining stability. However, the designer should be involved in a collaborative manner to ensure stability at all times.

This report also highlights the potential value of visits by the design team who may (as on this occasion) identify a problem. A current trend to minimise site attendance by the design team is most undesirable; a matter that was brought up in the Edinburgh Schools Inquiry<sup>1</sup> and the *Independent Review of Building Regulations and Fire Safety: final report*<sup>2</sup>.

Reference should also be made to BS 5975<sup>3</sup> and PAS 8811<sup>4</sup>, as well as the Temporary Works Forum website<sup>5</sup>, for guidance on the management of structures in temporary conditions.

Specific to steel-framed buildings, the BCSA *Guide to the Erection of Multi-Storey Buildings*<sup>6</sup> provides advice on maintaining stability during construction.

Read the newsletter in full at [bit.ly/CROSS\\_NL\\_54](http://bit.ly/CROSS_NL_54).

**WHAT IS CROSS?**

**Confidential Reporting on Structural Safety (CROSS)** is a confidential reporting scheme established to capture and share lessons learned from structural safety issues which might not otherwise have had public recognition, with the aim of preventing future failures.

Analysis of the reported safety issues can provide insight into how the safety concerns or events occurred and spur the development of measures to improve safety.

**WHAT SHOULD BE REPORTED TO CROSS?**

**Structural failures and collapses, or safety concerns about the design, construction or use of structures should be reported. Near misses, or observations relating to failures or collapses (which have not been uncovered through formal investigation) are also welcomed. Reports do not have to be about current activities as long as they are relevant.**

**Small-scale events are important – they can be the precursors to more major failures. No concern is too small to be reported and conversely nothing is too large.**

**Your report might relate to a specific experience, or it could be based on a series of experiences indicating a trend which may require industry or regulatory action.**

**Submit a report to CROSS at [www.structural-safety.org/confidential-reporting/submit-report/](http://www.structural-safety.org/confidential-reporting/submit-report/).**

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