

# CROSS

## Confidential Reporting on Structural Safety

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Newsletter No 1, November 2005

### FROM SCOSS TO CROSS

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The Standing Committee on Structural Safety evolved as a result of a CIRIA Study Committee on Structural Safety in 1971 which recommended "the establishment of a professional committee on a permanent basis to keep under review questions of structural safety and make such recommendations for action as seem desirable".

Topics for consideration by SCOSS arise from many sources, but in future it is intended that the outputs from CROSS will be a significant component. SCOSS seeks information on matters related to the people, process and products connected with structural engineering. It identifies where risks are thought likely to be unacceptable and then seeks changes of practice which will maintain safety. Feedback is essential and has in the past been received through the day-to-day interaction of SCOSS members with the professions, industry and government. Almost two hundred topics have been closely studied. Many of these are, by their nature, fundamental and ongoing and of a general nature. Others are relatively detailed and result from incidents reported to SCOSS as potential problems.

It might be thought that the existence of SCOSS was sufficient. Whilst a process is in place allowing issues to be flagged confidentially to SCOSS, submissions to SCOSS are made by a limited number of people. This has worked well, but there are drawbacks. Firstly it can be difficult to establish the extent of a problem – a problem may be widespread but only identified by a few people. This can be limiting in terms of persuading others to attach sufficient priority to addressing it. Secondly, in our industry there are many issues which do not grab a headline in the way that past structural failures have. They are not always technical – requiring design rules to be revisited – but are often procedural.

Learning from the past is an essential component of development, for indeed without memory, and the ability to pass this on, failures are repeated. The same mistakes are made and the same accidents occur. The 'habit of retentiveness' was quoted by recently by the incoming President of the Institution of Civil Engineers Gordon Masterton as one of the necessities for progress.

CROSS is aimed at engineers and others working in construction who, by contributing their experiences, will help to improve structural safety. SCOSS will, as a result of analyzing the data received, use its influence with Industry, Institutions, and Government to effect changes where this is seen to bring sustainable benefit to our industry.

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### Structural safety

Structural safety refers to the strength, stability and integrity of a structure to withstand the conditions that are likely to be encountered during its lifetime. Structural safety is achieved through the proper procurement, design, construction and maintenance of the structure and the application of best practice.

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## NEAR MISSES

### Potential overload on buildings

A crowd gathered in a city centre to watch an open top bus tour by a successful sporting team. People gained access to the roofs of buildings and were densely packed around perimeters overlooking the streets. Fortunately there were no incidents but there was the potential for the collapse of roofs or parapets due to excessive loading for which they were not designed.

*Comment* A similar situation could be seen when the England cricket team toured London after winning the Ashes this summer. It should be part of the risk assessment for such events that access to unsafe viewing points is considered. There may also be a responsibility on building owners. This issue will be progressed.

### Items falling from buildings and structures

Examples were given in reports of incidents on structures where items had fallen off, sometimes causing injuries. The recommendation from the reporter is that designers should be aware of the hazard of loose items falling on workers and the public, coupled with a warning that the risk is especially high where there is any vibration. All appendages need robust attachment and security and there must be a thorough 'loose item' check before any such facility is opened.

*Comment* An important point on which further data will be welcomed.

### SCOTCROSS

One person a year is killed or injured in Scotland by material falling from buildings every year. A pilot study has been commissioned by the Scottish Building Standards Agency as part of CROSS to ascertain the size of the problem.

*Comment* There will be separate newsletters on the SCOTCROSS study for which a large amount of data is being collected from local authorities.

## COLLAPSES

### Ceiling collapse

A heavy ceiling in an entertainment building fell down fortunately when nobody was there. The ceiling was connected to an overlying concrete slab by proprietary fixings which may not have been suitable for that application. It appeared to the reporter that the responsibility for selecting the fixings was unclear.

*Comment* Surveys by the Construction Fixing's Association have also revealed that a number of structural fixing details are changed on site without the involvement of the designer (see the 15<sup>th</sup> SCOSS Biennial Report). The design and installation of fixings should be properly assigned.

### Masonry walls

There were reports of the collapse of several old masonry walls associated with adjacent construction work. According to the reporter this happens all too frequently on re-development sites with no apparent input from the designers for the new structures.

*Comment* Other failures known to SCOSS are of garden walls, masonry retaining walls, and the careless removal of load-bearing walls in house conversions. There is scope for more warnings and advice on the susceptibility of old masonry walls to alteration and undermining.

### Roof overloading

There was a report on the collapse of a flat roof with parapets and internal downpipes. There were no overflows and the drainage outlets became blocked with leaves resulting in ponding and over-loading.

*Comment* An obvious problem that should not have occurred but serves as a reminder about the inherent risk from such roofs and the importance of maintenance throughout the life of a building for it to remain safe. Maintenance information should be in the health and safety file.

**What should be reported?**

- concerns which may require industry or regulatory action
- lessons learned which will help others
- near misses
- trends

**Benefits**

- unique reservoir of information
- better quality of design and construction
- possible reductions in deaths and injuries
- lower costs
- reduced concerns about liability

**Founder supporters**

- Association for Consultancy and Engineering
- Construction Industry Council
- Constructing Excellence
- Department of Trade and Industry
- Health & Safety Executive
- Institution of Civil Engineers
- Institution of Structural Engineers
- Office of the Deputy Prime Minister
- Office of Government Commerce
- The Scottish Executive

## DESIGN ISSUES

**Grandstands**

One report was of a cantilever football stand vibrating when fans jumped in a synchronised manner. The risk of panic amongst the fans or of collapse was clearly unacceptable. Modifications were carried out to raise the natural frequency of the structure.

*Comment* This is a well documented issue but the message is worth repeating that appropriate knowledge of dynamics is still not widespread enough.

**Aluminium structures**

Safety lessons can be learned from the failure of a structure composed of aluminium tubes. The causes of the failure were complex but in part at least due to brittle behaviour of the aluminium at the joints exacerbated by methods used in the fabrication process.

*Comment* SCOSS welcomes reports on similar concerns which may erode safety factors.

**Computer aided design**

There has been a report that the steel design element of a software package does not automatically allow for nominal moments in the design of columns for simple structures.

*Comment* This is an example of an issue previously raised by SCOSS and others about the problems of validating the software model and verifying the output. The advice is to know the scope of the software, check results, possibly using more than one package, and check that the computer aided design is to the relevant codes of practice. Designers must remember that it is they, not software suppliers, who are responsible for design.

## BUILDING CONTROL ISSUES

**Timber connections, lateral loading and torsion**

Concern was expressed from one source about the standard of structural design submissions presented to local authorities. Three issues were highlighted: timber members and their connections, the design of masonry under lateral loading, and torsional restraint on steel beams. Indeed torsional effects are thought by the reporter to be often ignored and this can lead to distortions and undue deflection.

*Comment* Even on simple elements such as cladding, torsion can cause failure and co-operation between designers and fabricators is important.

**Design of timber structures**

On the subject of timber, an Engineer was reported to have applied an approximate design to an 'A' frame hall roof. This did not take account of the local bending and as a result the roof deflected so much that the structure was near to collapse in dead load state.

*Comment* SCOSS has already commented on the lack of skill evidenced on some timber designs and this must be addressed.

**Local Authority resources to check structural calculations**

A further aspect of local authority work that caused concern to a reporter was the lack of internal resources to check calculations. Coupled with the low quality of some submissions is the further concern about the possible introduction of self-certification by engineers for building regulation submissions.

*Comment* No doubt this and other issues of compliance will be debated for some time and more input will be useful.

## ENGINEERS ON SITE

### Steel fabrication

A question was raised concerning the quality of some steelwork and the issue of self-certification by the fabricator. The reporter also made the point that there have not been many structural failures due to fabrication defects in the UK but nor have there been significant snow loads for some years.

*Comment* Further reports on this topic will be welcomed.

### Excavations

On a construction site by a busy main road a reporter saw a deep excavation with no internal temporary works following demolition, and no protection against vehicles falling into the hole.

*Comment* Although this situation is already adequately covered by the Construction (Health, Safety and Welfare Regulations), Regulation 12, and the breach may well be related to issues such as competency, and therefore reports are welcomed in order to study the trend and underlying causes of near misses.

## FIXINGS

### Cladding fixed to stainless steel

A problem occurred with the failure of some cladding panels fixed to a stainless steel supporting angle with stainless steel screws. According to the reporter stainless steel strain hardens very rapidly and self-tapping screws bind up. On this occasion large pilot holes had been drilled and the screws were so loose that they unwound with air pressure fluctuations on the cladding allowing the cladding panels to fall off.

*Comment* SCOSS has previously received reports on problems with stainless steel in structural situations and further comments will be welcome.

### Stud framing with self-tapping screws

Another report was of proprietary metal stud framing fastened with self-tapping screws where the erectors used a different size of screw from that specified. This was spotted by the designer's Engineer.

### Latent shear stud defects

Shear studs on a building frame appeared to one reporter to be satisfactory when checked with the standard 'pull-over' to 5 degrees, but when hit with a lump hammer they snapped off, showing the weld metal to be honeycombed. A capillary film of water trapped between the sheets and the steel beams below caused the honeycomb bubbles. The concern is that there may be structures where the shear strength of the studs is reduced, but undetected. Another reporter highlighted a very similar problem when welding metal sheets down onto angles bedded in concrete. There was enough moisture trapped below the sheets (or in the concrete) to introduce serious porosity into the welds.

*Comment* Moisture can seriously weaken welds and other examples of this and related issues will be useful.

## CONCLUSIONS

It is hoped that the publication of these reports will encourage others to contribute, either on similar topics, or on different structural safety issues or concerns. As more data is collected its analysis will become more informative and definitive recommendations will be made.

## HOW TO REPORT

Go to the web site and for complete confidentiality download a report form and send it to PO Box 174, Wirral CH29 9AJ. Non-confidential reports can be sent by email to:

[dir.cross@btinternet.com](mailto:dir.cross@btinternet.com)

Comments on the scheme, or on this newsletter, can also be sent to this email address.

Web site

[www.scoss.org.uk/cross](http://www.scoss.org.uk/cross)