

CROSS

Confidential Reporting on Structural Safety

Newsletter No 8, October 2007

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INTRODUCTION

There have been several encouraging developments about the development of CROSS. At a recent meeting the current Presidents, and the immediately to follow Presidents, of the Institution of Structural Engineers and the Institution of Civil Engineers, were updated on the scheme and gave valuable input and encouragement. A major insurer of consulting engineers has recommended to its clients that use be made of the CROSS system to report concerns so that others may have the benefit of learning from these. The Core Cities Group representing the chief Building Control Officers from major cities in the UK are to support the scheme.

In this issue there are concerns about structures where there may be hidden degradation; firstly in walkable ceilings, and secondly with ground anchors. By publicising potential problems awareness will be raised to the benefit of users and the public. It is very welcome to see three reports from contractors; two about temporary conditions and one about steelwork delivered to site. There is also a concern published here that risks from earthquakes, and indeed other extreme events, are not understood by the purchasers of holiday or retirement homes overseas.

The success of a confidential reporting scheme cannot be measured in terms of the number of incidents that are prevented because this is not known, but it can be assessed by the number and quality of reports received and the outcomes from feedback. As a result of earlier reports to CROSS the manufacturers and distributors of a product are amending their advice to users. The supplier of another product is in discussion with SCOSS. Evidence from reports on temporary works collapses during alterations are being considered by the Health & Safety Executive in the formulation of new guidelines, and the concerns raised in Newsletter No 7 about Local Authority issues have been passed to the Department of Communities and Local Government.

To encourage more reporting a form has been added to the end of the Newsletter.

WALKABLE CEILINGS CAN DETERIORATE

A reporter has written about a complex and potentially far-reaching concern about unseen progressive deterioration in sandwich ceiling panels with mineral wool lamella cores. He says that since the Sun Valley incident (Hereford UK 1993), in which two firemen lost their lives, mineral wool cores have been generally specified for such ceilings because of their superior performance in fire. There are, he believes, countless square metres of such ceilings in use.

He goes on to say that in a more recent incident a team of four men working in the roof space above a food processing plant fell through the ceiling when this collapsed under their weight and the weight of the load that they were carrying. One of the men was seriously injured. The ceiling was constructed of 100 mm deep metal-faced sandwich panels with a core of mineral wool lamellas. The span of the panels involved was less than 2 metres whereas the safe span under BS 6399 loadings should have been almost 6 metres.

The cause of this has been identified as progressive degradation of the mineral wool lamellas under repeated heel impacts as people walk on the ceiling. Mineral wool lamellas have near-vertical fibres of relatively brittle mineral wool and these tend to fracture as rather rigid, but brittle, struts

NEWS ITEMS

Post incident reporting for UK dams

Although actual dam failure is very rare, incidents do occur at dams in the UK every year. In the past, learning from reservoir incidents has been carried out on an ad hoc basis. Defra and the Welsh Assembly Government recognized that other potentially hazardous industries have formal reporting systems and that the reservoir industry could benefit from a similar system. Since 1 January 2007 the Environment Agency has been responsible for a new voluntary system of post-incident reporting for UK dams. Reservoir owners can now inform the Agency after an incident or near miss occurs. The Agency will record this on a database and in some case may investigate further. Information on how incidents have happened and the lessons learned will be published in bulletins and the Agency web site.

email:
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www.environment-agency.gov.uk

locally under the heel impact. . As feet are never placed in exactly the same place twice, each time someone walks on the ceiling, some more fractures take place. In due course, regions of the upper face of the panel become completely delaminated and the panel loses all of its strength.

The panels which collapsed were on an access route which was used for routine maintenance of plant in the ceiling void. Such panels are generally classed as being suitable for "occasional access", precisely the circumstances which prevailed in the case in question. They had been in use for approximately 5 years and subsequent investigation showed that adjacent panels on this access route were in a state of incipient delamination as a result of foot traffic.

A European research contract under the acronym "ASP AN" investigated the durability of sandwich panels during the period 2002 to 2004. Panels included a range of core materials including mineral wool lamellas and several different rigid plastic foams. Subjecting the panels to repeated walking gave significant results. The mineral wool had locally lost its adhesion over an area measuring 100mm x 100mm after about 500 heel impacts whereas other core materials were relatively undamaged after up to 2,400 impacts.

There are two aspects to the resulting problem. Protecting new construction is relatively simple using, for example, spreader boards and edge protection. The industry needs to be vigilant in this respect and it is well known that a great deal of damage can be done to ceilings if they are not protected while plant and equipment is installed. The more significant problem concerns the ceilings in service which may be in varying states of degradation which is unseen and progressive. According to the reporter no nondestructive test is known whereby the condition of a ceiling can be established.

CROSS comments: *Composite proprietary panels are widely used and they can be required to carry live loads. Most will be entirely satisfactory but caution should be exercised. When specifying products designers should consider the obligation to avoid hazards (SFARP), before trying to control the resultant risks. Hence, the need to ask if these products should be used in situations where damage during operations could be critical? Under CDM regulations the Operation and Maintenance manuals might be expected to highlight dangers from walking on panels. This might not apply to alteration work where a contractor is involved who, despite the requirements of the regulations, does not have any knowledge of the problems that could exist. The main issue, as pointed out by the reporter, is the stock of existing buildings that may incorporate degraded panels showing no outward signs of damage but that are used as walkways. SCOSS thanks the reporter for bringing this matter to their attention and it will be considered further. Advisors, contractors and facilities managers should be aware of the potential problems. In the situation where there could be latent damage, and in the absence of any other information, panels should be regarded as potentially unsafe for additional loading. (Report 054)*

LONG TERM SAFETY RISKS FOR GROUND ANCHORS

Two reporters have been involved in several projects or potential projects where riverside sites have been considered for redevelopment. In each case, the river wall forms part of the strategic flood defences for the area and typically comprises of driven steel sheet piling held back by tensioned ground anchors up to 30m (or more) in length and raked at angles between 25° and 50° to the horizontal. Generally these works date from the mid - 1970's or early 80's.

The Environment Agency is usually responsible for ensuring that the anchors are maintained by their owners but it can often be difficult to establish ownership and who should be carrying out or commissioning maintenance. The reporters have not yet come across a site where routine inspection has been undertaken, despite almost 30 years having passed since installation. Even when ownership is clear, records are not readily available which indicate the types of anchor used, their positions, original prestress loads or procedures for maintenance, checks and inspections. This means that there are no benchmarks against which the condition and ongoing performance of the anchors can be checked. Sometimes records can be traced, but this is invariably very time consuming, involves numerous enquiries and often relies on good luck.

Where they have commissioned inspections, the reporters have found that most anchors have lasted well, are in fair condition and any loss of original prestress was not of major concern. However, isolated cases of significant rusting of anchor heads have been noted together with instances where anchors are no longer stressed at all. This suggests that, had monitoring not been implemented as part of the process of redeveloping a site, failures could have occurred and gone unnoticed.

Development of sites with ground anchors is difficult, complex and costly. Where development takes place, checks would normally have to be carried out to verify the integrity of the ground anchors. If development is uneconomic, and this may well prove to be the case for some sites, inspection and maintenance may never be undertaken, either due to lack of funding, inability to establish responsibility or ignorance of the need to do so on the part of the owner.

Experience of the reporters so far has been on tidal riverside sites where the environment is aggressive and the consequences of failure of the flood defence potentially very significant. Their concerns, however, also apply to other environments and locations including highways, railways and structures. CDM Regulations have required, since 1994, compilation of a Health and Safety File for all major developments with key details of construction and maintenance schedules. This is issued to the client on completion of a project. However, experience suggests that these are quickly mislaid or lost by the owner or not passed on to future purchasers.

The reporters doubt whether the owners or managers which may be affected recognise the importance of the anchors beneath them. Possible approaches to managing this risk might include;

- Establishing a central register of ground anchors into which records of all new anchors together with details which would facilitate their future maintenance must be deposited.
- Compiling a register of all existing sites with ground anchors together with as much relevant information or sources of information as possible.
- Providing a secure repository for existing records, which may otherwise be destroyed.

Perhaps, say the reporters, one of the main engineering Institutions could act as a catalyst and enabler for this? The survival of such valuable records relating to major and strategically significant infrastructure is surely too important to leave to chance?

CROSS comments: *This is example of components that may corrode without anyone being aware of the risks and where the failure of a single component could lead to overstressing of nearby structural elements. There have been a number of failures of ground anchors world wide and these*

may increase with time and the effects of aging. For new schemes clients should be made aware of the long-term liabilities and obligations at an early stage in the project. Maintenance requirements should be set out in a 'maintenance philosophy statement' such as that suggested in CIRIA C611 'safe access for maintenance and repair', and placed in the Health & Safety file. There have been other cases where no records were kept and the condition of anchors is unknown. SCOSS intends to bring this report to the attention of the conference on **Ground Anchors and Anchored Structures in Service** to be held at the Institution of Civil Engineers in November 2007 and being organised by the British Geotechnical Society and ICE. It will also be brought to the attention of the Environment Agency. (Report 087)

COLLAPSE OF BRICKWORK CLADDING

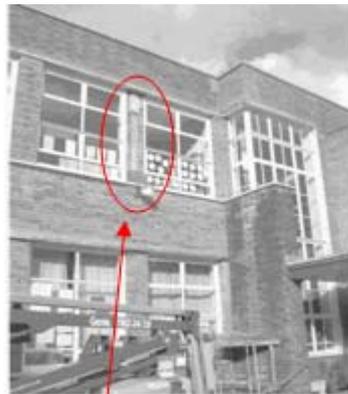
The external leaf of a brickwork pier at first floor level fell down onto the playground of a school adjacent to the main entrance door. Fortunately there were no casualties. The reporter believes that the structure is a concrete encased steel frame. Bricks on end had been used on either side of a column between windows to form a cavity and an external skin built without provision for tying back to the main frame. The school was closed for an initial period of a week whilst investigations were carried out on the rest of the elevation. The brickwork cladding was removed and replaced with an alternative material. The reporter's firm has advised the local authority in case there are other schools of similar construction in the same ownership.



Fallen masonry from SCOTCROSS



Collapsed freestanding wall from SCOTCROSS



Column from which brickwork fell



Concrete casing with no ties to brickwork cladding

CROSS comments: As with many other reports of masonry falls from buildings it is fortunate that there was nobody underneath at the time of collapse. The SCOTCROSS project which gathered data over a two year period up to August 2007 had 1,200 reports of material falling, or in danger of falling, from old buildings. In 12 cases passers by were injured. A full report on the project will be published in due course by the Scottish Building Standards Agency. There is a risk to people from falls such as the one given above and they are usually due to combinations of poor construction, poor maintenance, and weathering. Two examples are shown below. The most significant failures are those where there is a pattern and hence further falls can be expected if nothing is done. The Scottish investigation may be extended to other parts of the UK but meanwhile CROSS welcomes reports of falling, or dangerous and about to fall, materials. So far as new construction is concerned this is perhaps a timely reminder that good

building practice requires the ability to see how all items are restrained and retained within buildings, and that construction industry professionals should be proficient at good detailing. It is also a reminder to school authorities and school governors of the importance of regular condition surveys to detect defects before they become dangerous. (Report 078)

REGISTRATION FOR CROSS NEWSLETTERS

To subscribe to CROSS Newsletters navigate your web browser to the IStructE webpage www.istructe.org.

If you are already a registered user go to 'Click here to Login' on the top left of the webpage, enter your username and password, and click the 'login' button. When logged in click on the 'Update Details' on the right hand bar of the website. Click on 'Profile' and put a tick on the SCOSS/CROSS Newsletters box. You will then receive the Newsletters every quarter.

If you are not a registered user (and you do not need to be a member of the Institution to register) go to the 'Click here to Login' on the top left of the IStructE webpage. On the next page click on the 'Register' button on the right hand side, and there will then be a choice of: 'I am an IStructE member' or 'I am not an IStructE member'. Click on to the 'I am not an IStructE member' which will navigate you to a page with boxes for contact details. Complete the boxes and go to the bottom of the page where there is an 'Email preferences' section. Check the box for 'SCOSS/CROSS Newsletters'. You will then receive the Newsletters every quarter.

WIND ON INTERNAL MASONRY WALLS DURING CONSTRUCTION

There has been a generic report from a contractor about internal masonry walls during construction following his experiences of failures. Such walls are generally designed to withstand internal wind pressures but are often built before the building envelope is complete. This subjects them to significantly higher loads. The more competent contractors recognise this and provide additional restraints, such as wind posts. However many contractors, according to the reporter, do not have the skills to do this and are unaware of the limitations of these walls. The reporter suggests that designers should be questioning the programming of structures to ensure that their walls will withstand the pressures predicted for a specified construction sequence.

CROSS comments: *In these situations the designer of the wall should consider the construction phase and whether the design should be governed by this, rather than the in-use phase. If the wall may be unstable during construction due to short-term wind loads this should be pointed out to the contractor if it is not reasonably practical to design out this load case. The problems may however be more likely to occur when there is no designer involved. (Report 082)*

SITE HOARDINGS BLOW DOWN

A reporter from a large contractor writes to say that a timber hoarding failed in relatively high winds. Investigations into this and others by the reporter's firm indicated that the majority of site hoardings are erected with no design whatsoever. Most hoarding suppliers/erectors are, he says, completely unaware of the relevant Code of Practice (BS 6399:Part2) that should be used as the basis of design. Failures of posts, either by snapping or being uprooted, and of the ply facing due to inadequate fixings poses a risk both to the public and the workforce.

CROSS comments: *It is important that 'subsidiary' items receive due attention to ensure their structural stability. Hoardings can cause significant damage to people and property and should be adequately designed. Another contractor points out that when hoardings are designed to BS 6399 loads the general comment from the site/suppliers is that the design is too conservative and that thinner sections and smaller bases have been used elsewhere. However it is probable that, even if they stand up for some time, they would not withstand high winds. Site hoarding design should be the responsibility of the Temporary Works Designer and Co-ordinator. (Report 083)*

STEELWORK DELIVERED TO SITE

The contractor on a domestic building project reported that there were deficiencies in steelwork supplied to site. The splice connections were not as designed and detailed and had only one third of the required capacity. Actual members supplied were not as designed but were of a lighter weight. This was, fortunately, noticed before the steelwork was erected.

CROSS comments: *This emphasises the importance of quality control and the use of competent organisations. All steelwork engineers know that connections are the crucial components. Any reputable steelwork company will also know this so purchasers should beware of buying fabricated steelwork from companies who do not have adequate quality controls. (Report 080)*

EARTHQUAKE RISKS TO OVERSEAS PROPERTIES

CROSS has received a report about the many TV programmes in the UK (and probably elsewhere) dedicated to buying houses abroad. In these programmes the risks that are mentioned are usually to do with short term financial matters. However, the reporter has not heard any of the presenters talk about earthquake risks. This is of concern when, for example, a couple are seen putting their life savings into restoring an old stone masonry building, maybe in Italy or Greece. Depending upon location these buildings may have a high degree of earthquake vulnerability, and in the long term their purchase may turn out to be a poor investment. Therefore, the reporter thinks it would be sensible for SCOSS or CROSS to formally approach the main media outlets that produce such programmes for the need to point out some of the geohazards that exist. In the UK earthquake engineering is only used for safety critical facilities so there is next to no awareness of the general public to the risks that may be posed elsewhere.

CROSS comments: *The hazards of ownership in an unfamiliar country do not stop with seismic events. In several European countries this summer there have been devastating fires with the destruction of property and loss of life. Excessive heat is also a problem and one which will get worse with climate change. The main point made by the reporter is about second home owners relying upon less than expert advice on the quality of properties. These safety issues are not within the usual scope of work done by SCOSS but consideration will be given as to how the matter might be progressed. (Report 068)*

HOW TO REPORT

Please visit the web site www.scoss.co.uk/cross for more information.

When reading this Newsletter online [click here](#) to go straight to the reporting page.

Post reports to:
PO Box 174
Wirral
CH29 9AJ
UK

Comments either on the scheme, or non-confidential reports, can be sent to dir.cross@btinternet.com

DATES FOR THE PUBLICATION OF CROSS NEWSLETTERS

Issue No 9	January 2008
Issue No 10	April 2008
Issue No 11	July 2008
Issue No 12	October 2008

CROSS REPORT FORM

Please complete the shaded boxes and the description below
 For more information see www.scoss.org.uk/cross

Name:								<p>1. Your personal details are required only to enable us to contact you for further details about any part of your report</p> <p>2. You will receive an acknowledgement</p> <p>3. This original report will be returned to you</p> <p>NO RECORD OF YOUR NAME, ADDRESS, OR TELEPHONE NUMBER WILL BE KEPT</p>	
Address:									
Telephone:									
Date of report:		Approximate date concern was noticed:							
Affiliation		IStructE	ICE	RICS	other				
<p>please tick the small grey boxes</p> <input checked="" type="checkbox"/>		grade	none	graduate	technician	associate	member	fellow	
Location	England		Wales		Scotland		N. Ireland		elsewhere
Your job title:					Age of structure (approximate)				
Organisation - check		Project stage - check		Structure type - check		Material - check			
approved inspector		appointment		domestic building		brickwork			
builder/contractor		design process		building structure		pre-cast concrete			
client/developer		construction		bridge		pre-stressed concrete			
consulting firm		temporary works		highway		reinforced concrete			
government		In use		tunnel		steelwork			
LA building inspector		during maintenance		marine		stonework			
project manager		de-commissioning		water related		timber			
research/academic		demolition		other		other			
supplier		vacant				<p>where 'other' boxes are checked please describe in text</p>			
utility company		other							
other									

Description of the reason for concern - use additional sheets if necessary

Post your report to: **CROSS, PO Box 174, Wirral CH29 9AJ** Complete confidentiality will be maintained and the technical content, without identification, will be given to SCOSS for analysis. An EMAIL REPORT form is available on the web site www.scoss.org.uk/cross for use when security of electronic transmission is not of concern.