

Newsletter No 13, January 2009

Reports in this Issue

CDM co-ordinators	1
Design wind loading for tower cranes	2
Wind loads during construction	2
Advice wanted by amateur builder	3
Shop/domestic collapse 1	4
Domestic collapse 2	4
Pre-cast concrete canopies in houses	5

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INTRODUCTION

In December 2008 the highly successful Fourth Forensic Engineering Conference was held at the Institution of Civil Engineers in London. Under the heading 'from failure to understanding' there were papers on many different collapses and concerns affecting structural and civil enterprises. Not only are there repetitions of types of failure, often a generation apart, but similar problems occur in different countries. There is great scope for learning lessons from such events but it was noticeable that there is no generally recognised way of categorising collapses and no common form of reporting on failures.

The American Society of Civil Engineers has a programme for encouraging the teaching of forensic engineering and some universities in the UK are including modules on the subject. But as SCOSS has found, there is a great need from those in construction at every level for information on failures to be readily available and better ways must be established of disseminating this information. The idea, put forward by CROSS, of a database as a resource for practitioners was well received and will be developed in the coming months.

When reports are sent to CROSS they are de-identified and categorised before they are considered by our panel of experts. In some cases reports are held back to find out if there are others of a similar nature so that they can be published at the same time. In some cases SCOSS carries out investigations into matters raised by reporters and until these are complete the reports are not published, and there are several topics that are pending.

More reports are always needed and concerns about any structural or related matters will be most welcome and will help others to learn and avoid costly and un-necessary oversights, omissions, or mistakes. There is a report form at the end of this Newsletter.

ISSUES FOR CDM CO-ORDINATORS

A correspondent has written at length on issues of competence and his letter is summarised below.

The lesson of many failures is that poor detailing and joint failure commonly precipitate serious collapses. These may arise as straightforward structural deficiencies as exemplified by the spectacular failures of the Boulevard de la Concord Bridge in Quebec (2006) or the Minneapolis Bridge (2007), or they may be exacerbated by deficiencies in maintenance or poor design that inhibits the ability to inspect and maintain. Again, the de la Concord Bridge is an example, or the Piper's Row car park collapse in Wolverhampton (1997). To reduce the risk of such events occurring, one of the key items identified by SCOSS and CROSS has been the need for designers to have competence both in design and construction and competence in foreseeing the longer-term needs of the maintenance of a structure. Life-cycle considerations are vital. Contractor's competence, in relation to the failure information, relates to quality control of the construction elements. Having the right skills and being adequately supervised is of prime importance. However, comments in SCOSS and CROSS illustrate the lack of finance that is invested in long-term maintenance. This is a difficult issue for the CDM-C to raise with the client but when acknowledged, and acted upon, the quality of buildings will be improved.

CROSS comments: *It appears to be the case that designers regard getting adequate strength as their key function. Ensuring buildability, providing for durability and maintenance, and environmental impact, are often not given enough attention. All parties to a project have a responsibility to consider the*

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News item from the USA

Some customers at a new restaurant in South Boston ended up in hospital after part of a ceiling collapsed. Several heavy decorative wood panels that were suspended from the ceiling fell, injuring 11 people. There is no word on exactly what caused the ceiling to come down and the incident is under investigation at the time of reporting.

This is similar to the reports previously published by CROSS on ceiling collapses (Newsletter No 10 April 2008) and more, which have been received since then, will be published in a future Newsletter.

necessary competencies for the work in hand. Designers and CDM-Cs must also consider the whole-life aspects of the facility. Both these topics are well set out in the Industry Guidance:

www.cskills.org/supportbusiness/healthsafety/cdmregs/guidance/index.aspx and in CIRIA guide 'Safe access for maintenance and repair' C611 www.ciria.org.uk/acatalog/C611.html. The Health and Safety Commission Approved Code of Practice, 'Managing Health and Safety in Construction. Construction (Design and Management) Regulations 2007' www.hse.gov.uk/pubns/books/l144.htm, gives advice on assessing the competence of designers and CDM co-ordinators. (Report 118)

DESIGN WIND LOADING FOR TOWER CRANES

A report from a major contractor concerns wind loading on tower cranes. He says that tower cranes used in the UK predominantly come from manufacturers in continental Europe. These cranes and their foundation loads are designed using the local design standards, typically the DIN standard. These standards consider wind speeds across continental Europe, but do not consider wind speeds across the British Isles, which can be significantly greater than for continental Europe. The reporter's firm has issued a business wide alert and changed its procurement system to ensure that all tower cranes and their foundations are designed for the wind load at the location of use. They have taken this up with their crane suppliers who are providing the necessary information, but understand that others within the industry may not be doing the same.

CROSS comments: Tower cranes are large and important items of plant. Recent history has demonstrated a number of serious concerns in various parts of the world. In the UK this has led to an advice note on their use produced by the Strategic Forum ([Initiatives to Improve Health and Safety in Tower Cranes](#)). Early consideration by design teams is also required to ensure that cranes must be designed to withstand local condition and wind actions and be appropriately certified under the Lifting Operations and Lifting Equipment Regulations (LOLER) The UK is one of the windiest areas in the EU and CROSS would welcome more reports on wind loads relating to imported equipment.

Two years ago a luffing jib crane collapsed in Liverpool and as a result one worker was tragically killed, and the driver of the crane was injured. Following an investigation HSE wrote to all UK crane hire and supply companies asking them to take forward recommendations in an HSE technical report which sets out the most likely explanation for the collapse. This document 'Report on technical aspects of HSE's investigation into the collapse of a luffing tower crane at a Liverpool construction site on 15th January 2007' is available on: www.hse.gov.uk/construction/pdf/craneaug08.pdf. The possibility of wind effects as a contributory cause is mentioned. General advice from HSE is given on www.hse.gov.uk/construction/pdf/towercranes.pdf CIRIA also give guidance in their documents: 'CIRIA 654 2006 Tower crane stability' www.ciria.org/acatalog/C654.html and 'CIRIA 703 2003 Crane stability on Site' www.ciria.org/acatalog/C703.html. (Report 132)

WIND LOADS DURING CONSTRUCTION

Another report is also about wind loading. During construction the structure and associated temporary works are subjected to wind loading. This load case is typically short term and BS 6399 part 2 allows for a reduction in wind speed where the load is of a temporary nature. What is not made clear in the code, but is in the supporting documentation, is that this reduction is based on the expectation that in times of high wind load the structure will not be in use, and therefore the consequence of failure is not severe. When considering the stability of a partially erected structure or sheeted scaffold this expectation is, in the view of the reporter, not valid as the consequences of failure from wind could potentially be severe. Therefore, unless it can be justified and agreed, the reporter's firm does not permit a reduction in

What should be reported?

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

Benefits

- unique source of information
- better quality of design and construction
- possible reductions in deaths and injuries
- lower costs to the industry
- improved reliability

Supporters

- Association for Consultancy and Engineering
- Communities and Local Government
- Construction Industry Council
- Department of the Environment
- Health & Safety Executive
- Institution of Civil Engineers
- Institution of Structural Engineers
- Scottish Building Standards Agency

wind load due to the load case being short term. Their designers do however take advantage of seasonal reductions where appropriate.

CROSS comments: This report is about structures that are incomplete rather than about structures that are temporary. Temporary structures are only in place in a specific location for a relatively short period and advice on wind loads, as well as other aspects, is given in the 2007 publication from AGOTS ([Advisory Group on Temporary Structures](#)). It is important to assess the risk from winds on structures when wind is the dominant load on, say, a partially completed structure or a relatively light structure with a large surface area such as a sheeted scaffold. Small increases in wind speed, particularly when considering low wind speed, can result in much higher loadings since the force is proportional to the speed squared. In the partially completed state there may not be the stability, dead load, or robustness will exist on completion. Designers taking a reduction in wind speed should bear in mind that if their structure is sensitive to wind loads, a minor error in wind speed could lead to failure. The overall lesson is that designers should be wary in reducing wind loads and they need to weigh up the overall uncertainties, the effects of a minor change in wind speed assumptions, and the consequences should there be a sudden gust or a storm arise. (Report 133)

ADVICE WANTED BY AMATEUR BUILDER

This notice, seen by a reporter, was posted on a DIY website, and whilst it may be apocryphal, it illustrates the type of queries received by local authorities and Building Regulations officers.

Hi All

I am removing a supporting wall between the old exterior of the house and the new 'lean-to' extension. Because the 4-metre lintel will be fitted into the ceiling cavity I can't needle it but will be using 4 strongboys on the outside and 3 across supporting the ceiling on the inside. I will also have a couple of temporary across to use directly under the wall. The wall is a concrete block cavity wall. I have spoken to builders and structural engineers so basically know what I am doing but am taking it slow - for obvious reasons. I am interested in any general advice (apart from 'get a builder in!') but have two key questions:

- 1. How high above the lintel should I be putting the strongboys - I have heard 18 inches but can this be more or less?*
- 2. Can the strongboys be used to support just the outer skin? Because the inner skin is tied to the outer and sits on the joists and the joists are supported on the inside would this be enough or do the strongboys have to go through both skins of the wall?*

I have a system in ready to lift the lintel into place but the awkward bit will be getting it between the support piers and the strongboys at the top. Is it ever an option to lift the lintel into place and then build up the support piers and the concrete cap with the lintel already there?

Many thanks for any help and for reading this far!

CROSS comments: The message, which is true from large to small structures, is that the loading conditions during construction can be complex and demanding. Temporary works require a proper understanding of the load paths and a proper check of the structure's strength and stability during all stages of building work. Failure to make such checks risks structural failure and personal injury. The amateur 'builder' here is clearly incompetent to do the work, and is operating outside the statutory requirements of safety legislation such as the Building Act and Health and Safety at Work Act. He has a civil duty of care, of which he is probably unaware and risks criminal prosecution and the possibility that the house could suffer a partial or even total collapse. See CROSS reports 123 and 128 below for the dangers of not getting it right when working on domestic properties. However, the writer on the web site recognises that he needs help although this is an unconventional way to ask for it. (Report 125)

SHOP/DOMESTIC COLLAPSE No 1



Before



After

The building was a two storey corner (end of terrace) property fronting a very busy, narrow major route in an area which is normally busy with pedestrians and traffic. On the ground floor there was a shop and there was residential accommodation above. Work had been in progress, without Planning or Building Regulations approval, for about a month to create a basement and loft conversion. A Building Control Surveyor visited the property and advised the builder to stop work until the permissions had been resolved. However, work continued.

Internal cross walls had been removed and chimney breasts had been removed from the party wall. It appeared that the internal area was gutted and the floors were supported on new steel beams spanning parallel to the front from party wall to flank wall. The robustness of the structure had been seriously compromised as there was virtually no lateral stability system. The external walls had been underpinned, rather poorly, onto largely non-cohesive soil, and at the time of failure a mini digger was excavating for the basement. It is suspected that the digger undermined the toe of the underpinning.

As a consequence the underpinning began to kick inwards and the pavement adjacent to the flank wall started to collapse. Police and Fire Brigade services were summoned and immediately called in Building Control. The building control engineer who was summoned to the scene was concerned about stability, but was unable to establish the extent of the work without entering the building. He decided that it was not safe to do so. Within minutes the building collapsed into the basement and scaffolding was thrown across the streets. There were no injuries.

CROSS comments: *The lesson to be learned is that this alteration work showed a total lack of understanding of the first principles of building stability and of the way that stability can be compromised by alterations and inadequate phasing of the work. Planning Permission and Building Regulations approval are an essential pre-requisite to carrying out alterations. The involvement of a structural engineer or building surveyor would have prevented this needless destruction. The skill and ability of the building control engineer called to the scene is to be admired. (Report 123)*

DOMESTIC COLLAPSE No 2



Collapse after failure to underpin

This is a case of collapse caused by a builder carrying out underpinning works. The property is a semi detached house which at sometime had been part of a larger terrace. It had only recently been bought by a first time buyer who noticed a problem with the gable wall and a structural engineer was commissioned to investigate. The recommendation was that a new external leaf should be constructed off a new foundation including underpinning of the existing wall in short sections. The report also described works to be carried out before underpinning and these included a requirement to tie the existing wall into the main house. The engineer gave advice to the owner on selection of a suitably qualified contractor and also offered to supervise. Unfortunately the owner decided to engage a builder on the recommendation of a friend. The builder ignored the engineer's report in respect of preliminary works and sequencing of excavations. Instead a trench was excavated the full length of the gable and left overnight without any temporary support. During the early hours the wall collapsed and the photo shows the condition of the wall when the Building Control Officer attended. The occupiers, including a baby asleep in the cot in the rear bedroom, were lucky not to be injured and were rescued by the Fire Service. To make matters worse the builder is uninsured and the owner's insurers will not accept liability.

CROSS comments: *This is a tragedy for the owner who unwittingly appointed an incompetent builder after starting on the correct path by engaging a structural engineer. All alteration work should be carried out by competent builders who carry appropriate insurance - but how is an owner to*

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If you are already a registered user, 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) 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.

know this? Cowboy builders are the stuff of TV exposures but more needs to be done to inform the public of the risks involved in appointing the wrong person or firm. There is no regulation or licensing system in the industry which covers this gap and CROSS would be pleased to have views on the subject. These collapses are similar to some of the cases the HSE Specialist Inspectors of Construction Engineering have investigated, which involved fatalities, such as at Stanley Road, Bootle (29 January 2000) in which a man died. (Report 128)

PRE-CAST CONCRETE CANOPIES IN HOUSING

A reporter wants a warning passed on to those undertaking surveys of houses. He says that pre-cast concrete cantilever canopies which are slender and monolithic with lintels over entrance doorways, particularly those constructed in the 1960's and 70's, can be vulnerable to sudden collapse. He is aware of a number of such failures and has investigated one case where a child was crippled for life when such a canopy snapped and fell on her. The reinforcement is vulnerable to corrosion and may in some instances be deficient, whilst the concrete may contain chlorides and/or be of poor density. A competent building surveyor should generally seek an Engineer's views; often however valuation surveyors are not looking for latent defects and will usually caveat their reports. Engineers and surveyors should ensure that they routinely draw attention to the risks in cases where such a canopy may not have been included in the instructions for the survey. This is a form of 'falling masonry' risk.

CROSS comments: The first report in this Newsletter gave an example of a major failure brought on by concrete degradation (Boulevard de la Concorde). Housing units are not likely to have received the attention that such bridges receive, and so if anything are more at risk from concrete degradation, which is usually, linked to reinforcement corrosion. As this report shows the consequences can be horrifying. A competent surveyor ought to look for signs of degradation assisted by a knowledge of areas likely to be at risk. CROSS is grateful for this warning and is keen to hear from individuals, local authorities, housing associations and the like of their experiences in similar situations. (Report 126)

HOW TO REPORT

Please visit the web site www.scoss.org.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

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

DATES FOR THE PUBLICATION OF CROSS NEWSLETTERS

Issue No 14	April 2009
Issue No 15	July 2009
Issue No 16	October 2009
Issue No 17	January 2010

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			
please tick the small grey boxes	<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	<input type="checkbox"/>	appointment	<input type="checkbox"/>	domestic building	<input type="checkbox"/>	brickwork	<input type="checkbox"/>	
builder/contractor	<input type="checkbox"/>	design process	<input type="checkbox"/>	building structure	<input type="checkbox"/>	pre-cast concrete	<input type="checkbox"/>	
client/developer	<input type="checkbox"/>	construction	<input type="checkbox"/>	bridge	<input type="checkbox"/>	pre-stressed concrete	<input type="checkbox"/>	
consulting firm	<input type="checkbox"/>	temporary works	<input type="checkbox"/>	highway	<input type="checkbox"/>	reinforced concrete	<input type="checkbox"/>	
government	<input type="checkbox"/>	In use	<input type="checkbox"/>	tunnel	<input type="checkbox"/>	steelwork	<input type="checkbox"/>	
LA building inspector	<input type="checkbox"/>	during maintenance	<input type="checkbox"/>	marine	<input type="checkbox"/>	stonework	<input type="checkbox"/>	
project manager	<input type="checkbox"/>	de-commissioning	<input type="checkbox"/>	water related	<input type="checkbox"/>	timber	<input type="checkbox"/>	
research/academic	<input type="checkbox"/>	demolition	<input type="checkbox"/>	other	<input type="checkbox"/>	other	<input type="checkbox"/>	
supplier	<input type="checkbox"/>	vacant	<input type="checkbox"/>	where 'other' boxes are checked please describe in text				
utility company	<input type="checkbox"/>	other	<input type="checkbox"/>					
other	<input type="checkbox"/>							

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.