The success of CROSS depends on individuals and firms participating by sending reports of their experiences and concerns in confidence to Structural-Safety. This is the oxygen of the system without which it could not function and continued development depends upon a good flow of reports. There are far more failures or concerns than are reported so there is therefore considerable scope for progress. The names of reporters are never revealed and only the technical aspects that could help structural engineers are published. Newsletters contain a selection of reports which are, together with others, published on the web site data base which is a resource for engineers to learn the lessons from the experiences of their peers.

A major update of the web site has been completed. Most of the work has been associated with the Content Management System used for processing reports. There are several stages involved from receiving a new confidential report to producing a de-identified live report with comments, and this is now streamlined to give better efficiency and enable more data to be handled. Reports can also now incorporate pdfs. The comments on the reports we receive are from our panel of volunteer experts whose input is invaluable. They are from all sectors of the industry and their vast experience and knowledge is used to give impartial advice that can help prevent the type of events described from being repeated.

Talks and presentations are given to groups and firms to promote the scheme and if you would like to be included contact structures@structural-safety.org. If you value the scheme and have an experience that could be useful to others please contribute by sending a report to www.structural-safety.org/confidential-reporting/submit-report/. MORE REPORTS ARE ALWAYS NEEDED.

390 Fabrication Issues with Imported Steelwork Truss in Australia

The truss structure shown was tendered locally (in Australia) but fabricated overseas and imported. The construction, says the reporter, illustrated significant defects and deflected after erection requiring rectification. The builder undertook repairs on site, including reinforcing the areas where cracking occurred in the junction between cross beams and main truss beams and welding reinforcing tubing alongside sections of the cross beams that had split. This work was however deemed insufficient to stabilise the structure and as a result one of the local tenderers was engaged to rebuild the truss. In this process the original imported steelwork was removed and taken to their yard. Several additional defects and instances of non-compliance to the relevant Standards were found. Tensile testing showed the steel was 338 MPa yield strength versus a 450 MPa grade to AS/NZS 1163 Gr 450L0 called up in the engineer’s documentation. There were also other non-compliances. These cover AS/NZS 1554 welding, and the material specification AS/NZS 1163 for the hollow sections. Fabricator workmanship is largely not covered in Australian Standards.
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
- Bridge Owners Forum
- British Parking Association
- Communities and Local Government
- Construction Industry Council
- Department of the Environment
- DRD Roads Services in Northern Ireland
- Health & Safety Executive
- Highways Agency
- Institution of Civil Engineers
- Institution of Structural Engineers
- Local Authority Building Control
- Scottish Building Standards Agency
- Temporary Works Forum
- UK Bridges Board

To find reports in the database, go to the Quick Search box on any page of the Structural-Safety site and enter a subject e.g. "wall" and a list of summarised reports will follow. Searches can be refined using Search database facility.

Comments
This is an abbreviated version of a much longer report and describes a structure which had numerous problems. A complex fabrication such as this needs competent input at all stages. This report is primarily about defective workmanship and use of steel having inadequate strength but the comment about deflection after erection is curious. Deflection is governed by design and the steel's E value (which is not related to strength) and so perhaps there are aspects that could be related to design. The report demonstrates that steel member capacity is just as much governed by fabrication quality as design and that all projects require adequate documentation and inspection to assure that what the designer thought was being provided was actually provided. This applies wherever the fabrication is carried out and where standards may be misconstrued. Physical examination of the processes in situ may be advisable. Structural-Safety has previously warned of inadequate documentation accompanying imported components: Anomalous documentation for proprietary products - February 2013.

433 FAILURE OF PRE-CAST CONCRETE ‘L’ SHAPED RETAINING WALL

A recent incident occurred on a site, where a temporary pre-cast retaining wall failed leading to a pile of clay approximately 3m high spilling through the wall. The fill was fortunately prevented from falling further by a site boundary hoarding. This was located immediately adjacent to an operational railway, and had it failed the hoarding and the fill could have fallen into the path of an oncoming train, potentially injuring railway staff and customers. The reporter says that failure was at the bend in the L shape, suggesting that the overturning moments caused by the clay back-fill exceeded the capacity of the precast units. The applied moments could have temporarily exceeded the design moments due to the recent periods of sustained heavy rainfall leading to saturation of the stored clay material. The reporter says that similar incidents have occurred on other sites.

Comments
There have been failures over the years where temporary stability has been inadequate. Here, whether the designer was fully briefed, or whether the design limitations were spelt out, but ignored, we do not know. Both are vital to a safe design as is a design check. Again a suitable risk assessment is vital especially where there is the possibility of a small failure leading to major consequences, such as a train derailment. The HSE publication: Preventing catastrophic events in construction (2011) examined these ‘low probability but high-consequence’ safety hazards by looking at:
- the types of catastrophic event which have occurred or which might occur during construction;
- the reasons for occurrence when there have been (or could have been) catastrophic events during construction, including an
Advanced notice of a Symposium being staged jointly by Structural-Safety and the Construction Fixings Association:

**Improved Structural Safety from better use of construction fixings. An introduction to BS 8539.**

A series of fixing failures - some fatal - prompted the publication of this British Standard – BS 8539:2012 *Code of practice for the selection and installation of post-installed anchors in concrete and masonry.*

The code sets out the roles and responsibilities of all stakeholders involved with the use of construction fixings.

This Symposium, staged by the Construction Fixings Association in conjunction with Structural-Safety - whose Director, Alastair Soane, will chair the events, will help specifiers and contractors to understand the code and implement their responsibilities.

Two identical 3 hour events are being held on 1 October starting at 10.00 and 14.00. Entry is by printed ticket only charged at £30 per head – tickets are transferable within your organisation. Lunch is included and starts at 13.00 to allow an opportunity to talk to staff from Structural Safety and the CFA.

For tickets go to: 
http://www.eventbrite.co.uk/e/improved-structural-safety-from-better-use-of-construction-fixings-an-introduction-to-bs-8539-on-1-tickets-12191177139

For more information contact the Construction Fixings Association via their website at www.the-cfa.co.uk or telephone 01664 823687

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**380 Composition of new large concrete blocks**

A UK firm has come across a new large precast concrete block range which seems to use a wide range of secondary recycled aggregates in its mix, including some potentially hazardous waste. They are manufactured by a European precast concrete manufacturing company and contain, amongst other material, Cathode Ray Tube (CRT) glass without proper crushing and treatment to remove lead and other contaminants. Tests were carried out on a sample and significant concerns over the applicability of the aggregates used in the blocks were found. A wide range of materials were found to have been used as fine and coarse aggregates including varying sizes of CRT, plastics, copper wire (with its plastic insulation), and fibrous and friable materials. The potentially reactive aggregate content may have affected the compressive strength of the blocks. The blocks, which are supposed to be used in high capacity load-bearing retaining walls reaching six or seven metres in height, have a compressive strength of 10.5 N/mm². This is compared to 18-35 N/mm² compressive strength usually required for such blocks. There also major concerns over their long term durability. The reactive aggregates may have connotations to Alkali-Silica Reaction (ASR). Microscopic testing also shows that some of the recycled material content appears to have undergone significant chemical and physical change from its original state (with some affecting the permeability of the product – see micro photograph). There is also concern about bonding and evidence of general oxidation/ expansion issues and chemical attack on the hydrated cement paste which may have been caused by salts leaching from the waste materials used in the mix. The reporter is extremely worried about the structural integrity of such blocks and the potential environmental and health and safety concerns associated with their use.

**Comments**

The issues with the retaining wall blocks made from recycled materials is interesting (and worrying). There was industry interest a few years ago about the use of recycled materials being incorporated in structural concrete (at the higher value end of recycling). The Highways Agency undertook research to look into this, and indeed produced an outline specification (not published). The underlying issue was the need to have traceability and
provenance of materials to be used in recycling (RCA – recycled concrete aggregates were essential and not general recycled waste), and also to have plants available to ensure that only suitable materials are tracked and recycled. WRAP were involved on the periphery of the work. Demonstrating long term durability was the main concern. There have been numerous other research projects looking at putting all manner of recycled and secondary materials into concrete. Experience tells us that many of the deterioration mechanisms that affect concrete take many years to develop and a 28 day strength may not represent the strength or condition after 10 years. Deterioration can be by failure of the base materials, freeze/thaw, moisture instability, or by unforeseen internal reactions. It is essential that any new products have undergone sufficient testing backed up by third party certification, with adequate quality control, such that the chances of future failure are minimised. The Environment Agency is responsible for regulating exports of any waste materials from England and Wales. CRT glass as mentioned in this report is classified as a hazardous waste and export from the UK must take place under a Transfrontier Shipment (TFS) of waste notification. The notification process ensures that the competent body in the receiving country is satisfied with the import of the CRT glass. The notification process also allows the Environment Agency to be satisfied that the material is being sent for recovery to a correctly permitted facility overseas. It is understood that British Precast will produce a specification for the inclusion of waste and secondary products into precast concrete and how the End-of-Waste criteria should be looked at for such products. The dangers of a retaining wall collapse are illustrated by report 433 above.

375 CORROSION OF PLASTERBOARD WALL FIXINGS

A reporter sent pictures from a site where metal plasterboard fixings had deteriorated only a few months after installation. The heads of the fixings were removed using a hole saw to reveal the extent of the corrosion. The reporter says that metal anchors are used to meet fire regulations, although he is uncertain of the origin of this requirement, but that using metal fixings in insulated panels generates cold bridges and can at best cause damp spotting on the surface of the wall and at worst it can lead to corrosion if a low grade metal fixing is used. He is concerned that cheap metal fixings are being brought into this country from the Far East and the market is flooded with them. Many of these, he believes, are susceptible to corrosion. When asked to provide metal anchors to comply with board manufacturers’ requirements the reporter’s firm offers a stainless steel version but even this causes cold bridging.

Comments
This is a good example of the role that ‘understanding materials’ plays in assuring safety. Corrosion and degradation always affects safety to some extent and only feedback of performance in practice will assure ongoing reliability. In any wall construction it should always be assessed where the dew point may lie so as to avoid interstitial condensation. Cold bridges can locally change the dew point, and potentially cause corrosion to unsuitable components. It may be that the effects of cold bridging were not taken account of in this case. It is understood from industry sources that two metal fixings are usually required per board to satisfy the need for a fire rating but the origin of this information is not known. The issue of how to avoid cold bridging while satisfying a fire rating is also unclear. If any readers can shed light on the situation please advise Structural-Safety. The experience also links back to previous CROSS reports of poor quality materials.

368 POTENTIALLY DANGEROUS EXCAVATION

A reporter has submitted this photograph of a potentially dangerous excavation. The reporter’s concern was that when the picture was taken there appeared to be no road plates under the digger with little bearing either side. An operative also appeared to be working under the machine. There
also appeared to be no trench shoring and it looked rather deep with the
digger working near exposed pipes. The reporter did not believe that these
works were being carried out safely and due to the public nature of the
works believed this could affect not just the workers but the public too.

Comments
Poor safety in routine ground works is a perennial problem. There are
innumerable examples of diggers and other heavy equipment falling into
evacuations and innumerable examples of ground collapse, many
resulting deaths and injuries. Constant education of the dangers is
required at every level. No competent contractor would allow the situation
shown in the photograph to develop and it reflects not only on the
contractor responsible but also any other contractors involved in the
project, and indeed the client which engaged them.

384 Brick Wall Removed to Leave Precast Panels Unsupported

Removal of a 9 inch thick (230 mm) brickwork wall left precast roof slabs unsupported. It is not clear
if any thought was given as to whether or not this might be a load bearing wall before demolition.

Comments
This would obviously have been, at least to a structural engineer, a building where the walls were
load-bearing and to remove one in this careless manner would be to invite collapse. No changes
should be made before a competent person has assured that it is safe to do so. When there is
any doubt, the advice of a structural engineer should be sought. However this is a common
problem, particularly at the domestic end of the industry. Many buildings have collapsed owing to
a lack of proper consideration of stability and incorporation of the necessary temporary works.

385 Failure of Existing Basement Wall

A basement retaining wall failed when a new basement was formed by
excavating 1.8m. Some temporary works had been designed and installed
by the demolition contractor. However the demolition contractor had no
knowledge of the follow-on works. No checks had been carried out on the
wall. At the time piles were being installed and this probably softened the
ground which did not help.

Comments
CROSS have had previous examples of failures in basements (including
simple domestic basement work) where excavation below the toe line has
allowed walls to kick in. Anyone excavating a new basement 1.8m below
an existing basement should clearly have had a competent plan and
competent temporary works. The point has been made several times that there are dangers at
the interfaces of contractors and for anything complicated, there should be one party in overall
charge of stability. Basement works are recognised as a problem issue in domestic construction,
particularly in London. Advice available from several sources including ASUC:  http://
www.asuc.org.uk/specialist_underpinning_subsidence_publications.html
A report has been received regarding a 2-storey mid terrace house built approximately 35 years ago with a trussed rafter roof. Lateral movement of the roof tiles of some 35mm was visible on the front and rear elevations as shown. Clearly, says the reporter, the roof structure is inadequately braced which has allowed the trusses to move laterally and other properties in the terrace are similarly affected. Additional bracing was required.

**Comments**

Even if there are no external forces, there will always be a tendency for a heavy mass to move sideways: the mass will always be eccentric to the vertical supports. This was a common defect in early trussed rafter roofs often caused by slight out of plumb during erection and inadequate provision of diagonal and longitudinal bracing. BS 5268 Part 3:1985 ‘Structural use of timber. Code of practice for trussed rafter roofs’ provided the necessary specification and guidance. This was promoted by BRE in their Defect Action Sheets including two in December 1987 dealing with remedial measures: 110 (Design) Dual-pitched roofs: trussed rafters – specification of remedial bracing and 110 (Site) Dual-pitched roofs: trussed rafters – installation of remedial bracing. Now that BS 5268 Part 3 has been withdrawn, the guidance can now be found in Annex E of BSI Published Document PD 6693-1:2012.

Whilst CROSS has taken every care in compiling this Newsletter, it does not constitute commercial or professional advice. Readers should seek appropriate professional advice before acting (or not acting) in reliance on any information contained in or accessed through this Newsletter. So far as permissible by law, CROSS does not accept any liability to any person relating to the use of any such information.

**HOW TO REPORT**

Please visit the web site www.structural-safety.org 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 structures@structural-safety.org

**DATES FOR PUBLICATION OF CROSS NEWSLETTERS**

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