Structural-Safety
SCOSS and CROSS

The Institution of Structural Engineers | ice Institution of Civil Engineers | HSE

CROSS

Confidential Reporting on Structural Safety

Newsletter 59 | July 2020

Editorial

There are common themes to the reports in this edition and they are:

- Problems with design co-ordination
- Problems over quality of site control
- Problems over inspections on site
- Problems over changes on site

Around half of CROSS reports are about problems on site and a root cause is that designers are not represented to see that what is constructed complies with the design.

In recent years some owners have become reluctant to engage structural engineers, or independent inspectors, to review works on site having been persuaded by contractors that they can scrutinise themselves the works they are building, or simply in a bid to save money.

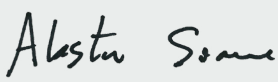
When something goes wrong due to poor workmanship or inadequate supervision, the subsequent costs are likely to be far higher than the costs of proper inspection. Indeed, the unwillingness of clients to pay for this can be a contributory cause to the resulting problems. Do clients, or their advisors, recognise the requirements of CDM and their responsibilities thereunder?

Reports in this issue include cases of reinforcement not being properly placed, of communication problems on major repairs, of insufficient fire protection not being identified in a timely manner, and of main structural steel members being butchered to allow for the passage of drainage pipes.

Other issues highlighted are related to the design phase, which account for about a quarter of CROSS reports, and again the unwillingness of clients to spend money is a factor; this time in relation to professional fees.

On design and build jobs, the client for the detailed stages is the contractor and the continual push for the lowest price affects the quality of design and the ability for adequate communication to take place amongst the team. Contractors want early involvement in projects to ensure buildability and efficiency, but the quality of design must not be compromised. Ideally this this should result in problems being identified before the works start.

One of the potentially most serious issues on site is when changes are made without authorisation either deliberately or in a thoughtless manner. If the change is one that affects structural safety or fire safety aspects and potentially compromises lives, then the cost of proper communication, responsible co-ordination, and independent scrutiny becomes trivial.



DIRECTOR:
Alastair Soane

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HOW TO REPORT
For more information, please visit the How to Report> page.

If you have experienced a safety issue that you can share with CROSS, please Submit a CROSS Report>.

If you want to submit a report by post, please send an email to cross@structural-safety.org> asking for instructions.

KEY
- Ⓡ CROSS Report
- Ⓒ CROSS Panel Comments
- Ⓝ News
- Ⓘ Information
- Ⓜ In Memoriam
- > Denotes a hyperlink

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894: Checking reinforcement before concrete pours

REPORT

A reporter from a consulting firm has concerns about rebar being positioned on site prior to concrete being poured. As part of their services, they insist on visiting the site to view and comment on the installed reinforcement bars prior to concrete being cast. These range from RC ground beams on smaller projects, up to multi-storey RC framed buildings. They are aware that this is not standard practice with most other projects as the project Structural Engineer will not usually be requested to visit site to comment on installed reinforcement.

Typically there are significant issues with laps, cover, shear reinforcement incorrectly installed and spaced, spare or leftover bars, which should be impossible as every scheduled bar is needed, incorrect spacing, and incorrect layer directions (e.g. B1/B2 and T1/T2 are in the wrong directions). Generally, the response from the contractor on site is that Building Control have said it is fine and passed it.

What happens on all other projects that the Structural Engineer does not insist on visiting the site to comment on reinforcement? The reporter has little faith that the Main Contractor or the Building Control Inspectors, neither of which are typically Structural Engineers, will be picking up these issues.

COMMENTS

Independent checking, ideally by the original designer, is the most straightforward way to check quality and accuracy of installation. However, there are also benefits in contractor detailing, where the detailing can be tailored to the contractor's construction sequencing and thus potentially improving economy and site safety. There are also contractual systems where the designer is novated to the main contractor. Both of these approaches mean that the designer is not truly independent of the contractor. Conversely, there are main contractors who will employ Structural Engineers to check the reinforcement fixed by their subcontractors and who are independent of those fixing the reinforcement.

Generally, two safety issues stand out from this report:

- No changes should be made unless sanctioned by the designer.
- The observations reported are part of an unwelcome trend whereby designers fail to verify by inspection that what is being built is what they thought was being built.

Building Control Officers can only be 'experts' in Building Control, and whilst some may be structural engineers, it is not their primary role. They should not be relied upon to ensure contractor's quality of work. Just because they have passed it, does not absolve the contractor or designer of their responsibilities.

The observations reported are part of an unwelcome trend whereby designers fail to verify by inspection that what is being built is what they thought was being built.

It is essential that steel fixing work is undertaken by trained and knowledgeable persons under suitable supervision. Competent site work is a significant factor in ensuring the long-term integrity of the RC for its intended design life. For instance, a lack of cover or debris being present, too much cover, inadequate vibration compaction, inadequate ties of rebar resulting in movement during vibration, or misplaced and missing rebar, will often manifest themselves not on striking the formwork, but many years down the line.

In addition to poor quality control, there may be other causes for changes on site. Rebar detailing is a skill and incorrect detailing can mean bars are impossible to position accurately, or even fit in. Cases are known of contractors omitting bars where fit is impossible or where rebar density is so high that concreting is impossible. Guidance on good detailing is given in the IStructE **Standard method of detailing structural concrete (Third edition)>**.

A further issue on site is the need to check that the concrete mix supplied, especially when there are specialist mixes, comply with the specification.

SUBMIT REPORT

SUBMIT FEEDBACK

INFORMATION

What should be reported to CROSS?

Structural failures and collapses, or safety concerns about the design, construction or use of structures.

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 so 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.

Benefits of CROSS

- Share lessons learned to prevent future failures
- Spurs the development of safety improvements
- Unique source of information
- Improved quality of design and constructon
- Possible reduction in injuries and fatalities
- Lower costs to the industry

Supporters of CROSS

- Association for Consultancy and Engineering (ACE)
- Bridge Owners Forum
- British Parking Association (BPA)
- Building Research Establishment (BRE)
- Chartered Association of Building Engineers (CABE)
- Civil Engineering Contractors Association (CECA)
- Confidential Incident Reporting and Analysis Service (CIRAS)
- Constructing Excellence
- Construction Industry Council (CIC)
- Department of the Environment (DOE)
- DRD Roads Services in Northern Ireland
- Get It Right Initiative (GIRI)
- Health and Safety Executive (HSE)
- Highways England
- Institution of Civil Engineers (ICE)
- Institution of Structural Engineers (IStructE)
- Local Authority Building Control (LABC)
- Ministry of Housing, Communities and Local Government (MHCLG)
- Network Rail
- Royal Institute of British Architects (RIBA)
- Royal Institute of Chartered Surveyors (RICS)
- Temporary Works Forum (TWf)
- UK Bridges Board

926: Emergency motorway lane closure during concrete repairs

Ⓡ REPORT

The incident involved an unplanned emergency lane closure of a bridge carrying a motorway. This was required to mitigate the risk of overload of the bridge after excessive concrete removal to the soffit during repair works. The bridge consisted of 3 spans with half joints for a central suspended span. Leaking road surface water through the half joint and longitudinal central reserve joint had contributed to extensive concrete repairs being required to mitigate the risk from falling spalled concrete and further reducing structural capacity (Figures 1 and 2).

A structural assessment was carried out prior to the concrete repairs which put detailed constraints on the amount of concrete to be removed from the soffit. These constraints included limits on the extent of repairs over-night, which were highlighted on the drawings and as the first key risk on the Pre-Construction Information passed to the Contractor and subsequently the Sub-Contractor.

A sequence of misunderstandings led to a larger area of removal, which exceeded the specified constraints. The extensive areas of spalling on the central span near the half joint led the site team to believe, incorrectly, that the constraints were only applicable to this area, not the side spans. The hydro-demolition team cut out a much larger area of concrete than had been planned (Figure 3).

An assessment was then carried out by the designers which found that the structure did not now have enough capacity for the required live loading. Poor deck reinforcement detailing, combined with the extensive concrete removal, meant that permanent, significant deformation and damage could have occurred. This led to an instruction to immediately close the lane above the repair area and to repair the soffit the following nights (Figure 4).

The incident highlighted specific lessons learnt for the scheme, but also wider lessons learnt for concrete removal schemes:

- The start of shift briefings to the hydro-demolition sub-contractor were not highlighting key constraints.
- A clearer visual method of highlighting the constraints on the drawings may improve clarity on site to cover, where operatives may not be reading the full details of the agreed procedures.
- Hydro-demolition teams should always be made aware of constraints and the maximum areas they can remove. The areas should be approved and accepted by a competent supervisor from the designer's team prior to its removal, especially when working in a protected area enclosed by non-transparent sheeting.
- An Emergency Procedure Document needs to be prepared before the start of works and briefed to the site supervision team to avoid leaving a site team uninformed of possible risks and/or placing them in a situation where they are forced to make an un-informed decision under intense pressure.

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- The sample hammer survey used to form the original scope of works indicated repair areas significantly smaller than the final repair areas found on site with the full, detailed hammer survey. This led to constant programme and cost pressure on teams and less use of the previous repair extent drawing which highlighted the constraints. Full hammer surveys of the whole structure immediately prior to scheme procurement would allow proactive planning of works instead of reactive planning.
- Concrete repairs recommended in several previous Principal Inspections and Management Strategies were not given funding until extensive deterioration that risked affecting bridge capacity had occurred. This possibly highlights limited funding to manage a large stock of deteriorating structures, forcing reactive instead of cost-effective proactive maintenance.

Ⓜ IN MEMORIAM

In memoriam Richard Snell BSc(Hons) FICE FREng FIStructE

It is with deep sadness that we have to report the death of our SCOSS (Standing Committee on Structural Safety) colleague Richard Snell.

Richard was a valued member of our Committee with 45 years' experience of marine and offshore civil and structural engineering. He worked for BP Exploration from 1980 to 2007 and latterly was responsible for the technical practices applied in projects and operations worldwide.

He was a leading contributor to the deep water systems R&D which has guided most of BP's deep water developments and to the R&D conducted after the Piper Alpha incident. He has authored or co-authored more than 35 papers and was the founding Chairman of the ISO Offshore Structures Standards Committee.

His wisdom and insights will be missed.

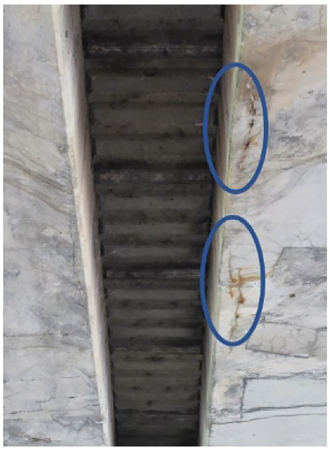

Figure 1
Initial damage

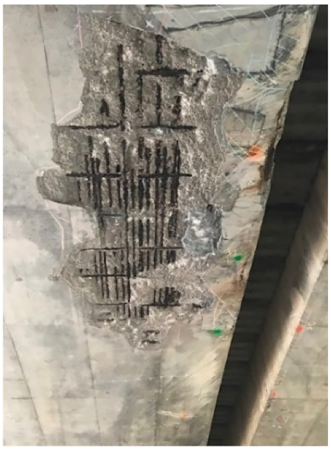

Figure 2
Loose concrete removed

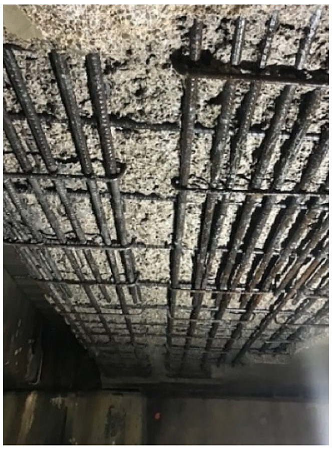

Figure 3
Hydro-demolition

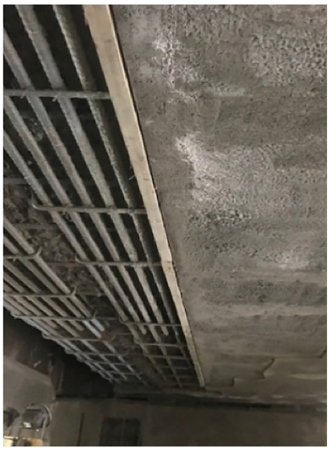

Figure 4
Repaired section

C COMMENTS

Apart from the technical issues in this report, recurring themes can be identified:

- Communication of design intent which is vital but not always easily achieved;
- As in the first report of this Newsletter (Report 894), designer absence from site is detrimental, particularly on a project like this where there must be uncertainty;
- An objective when planning must be to detect error before it progresses too far.

More widely, this report shows yet again that the concept of structural safety must include recognition that structures deteriorate. Some structural forms are more prone to this than others and bridge deck half joints are one such arrangement. As well as reducing the load-carrying capacity, the exposure and debonding of a significant amount of reinforcement may well change the failure mechanism of that span to one where there is less warning of failure.

It is of interest to note that concrete repairs previously recommended had not been carried out. It is probable that if the repair had been done earlier, then the extent would have been less. Whilst financial models often advocate delaying expenditure, this may not be the most economical solution if the subsequent repair is more extensive/complex.

All asset owners aspire to maintain their asset to maximise the life, however available budgets do not always permit this. Therefore, it is important to determine the condition of the asset and then identify what work can be done to address any issues within the budget. Large asset owners, responsible for hundreds of structures, use management processes to prioritise work. This relies on regular inspections and interventions must always take place before any structure deteriorates beyond repair.

The execution of the works such as those described need to be supervised by a competent person, who is able to advise on the changing extent of the repairs, and how these would affect structural safety. Often, more substantial demolition and repairs are required than were originally planned. The reporter is right about the necessity for a readily available Emergency Procedure Document (contingency plan) – and everyone being aware of its contents.

More widely, this report shows yet again that the concept of structural safety must include recognition that structures deteriorate.

SUBMIT REPORT
SUBMIT FEEDBACK

N NEWS

Inquiry into the Basis of Design and Method of Erection of Steel Box-Girder Bridges

It is 50 years since the collapse during construction of the Cleddau Bridge in Wales. The subsequent Merrison report changed the way in which bridges were designed and constructed. A key message was the need for independent checking of designs in both the permanent and temporary conditions. This remains a vital lesson for all bridge engineers and the Merrison findings should be essential reading for younger professionals at the start of their careers. It is out of print and not easy to locate online but CROSS have been given permission to share this from the Welsh Government Library Service.

View Report of the Committee>

Extract from the 1973 Merrison Report:

The recommendations include:
(a) an independent check of the Engineer's permanent design;
(b) an independent check of the method of erection and design of temporary works adopted by the Contractor;
(c) the clear allocation of responsibility between the Engineer and the Contractor; and
(d) provision by the Engineer and the Contractor of adequately qualified supervisory staff on site with their tasks and functions clearly defined.

921: Fire protection of mixed hot/cold rolled steel structure

Ⓡ REPORT

Building form
A reporter describes how a development was designed and constructed with both a traditional Steel Frame and a lightweight Steel Framing System (SFS). A mix of the two approaches was used with commercial units on the lower floors constructed using a steel structure due to the large spans along with acoustic detailing to separate the commercial from the residential above. The upper residential floors were of SFS construction.

This is a 'high rise' development as defined in the technical standards at the time of application. The period of structural fire protection was revised during the early design process from the required 2 hours (to meet the prescriptive Technical Standards requirement for 'long' duration of fire resistance) to 1.5 hours, achieved through a performance-based fire engineering approach. The agreed method for fire protection of the steel frame structure on the lower storeys was intumescent paint directly applied to the steel. Over this were several layers of plasterboard which were to form an acoustic separation from the commercial building to the residential buildings above.

The upper residential floors were SFS and were required to meet with tested forms of fire protection and acoustic separation. These were, as is generally the case, determined by the individual SFS supplier.

The SFS was a combination of cold rolled steel 'C' section studs with flat plate cross bracing brought together as panels which work in combination with hot rolled steel section columns and beams. In areas these resemble steel frames where for example the ground floor layouts differ from the upper floor layouts and walls do not stack. The designers' details were developed on the basis of this information to account for fire separation and acoustic performance of the structure. The floors were profiled galvanised steel sheets with concrete infill to minimum 160mm depth. Bars as necessary to allow the concrete floor to meet the required and tested fire, structural and acoustic separation. Floors were supported onto a 'top hat' detail or flange of steel beams.

Fire protection of the structural walls was by over-cladding with plasterboard and the specification of this was determined by the certification provided by the SFS supplier and designer. In all but extreme load cases, the steel posts were sized to be within the depth of the wall panels. Wall structures were fire protected by the plasterboard sheets full height. The 'top hat' section and flanges supporting the floors were also fire protected by plasterboard sheeting.

There were some areas where hot rolled steel was required either to support larger floor spans, usually associated with open plan living areas, or where supporting walls from above do not align with those below. The location and size of these hot rolled steel beams was determined by the SFS supplier. These beams were predominantly encased in the concrete floor and depending on depth, were occasionally fire protected by the wall cladding. They sometimes presented themselves as a base flange or more obvious steel beam depending on depth.

In this case, the understanding of fire protection of these floor steel elements was incomplete, and they were not identified as requiring fire protection because they formed part of the floor structure. Specific scenarios of these steel beam encasements were not provided on the architectural details and the building was constructed without necessary fire protection encasement.

Identification & remediation
The issue was identified when a construction-phase inspection by the main contractor of the detailing on another phase of the development queried elements of encasement. Investigation led to an understanding that the encasement was insufficient, and the in-construction phase was remedied. A subsequent intrusive survey of the completed and occupied first phase of the development identified the same issue.

A combination of intrusive survey and re-visiting construction information allowed the designers and contractor to understand the extent of the issue and design a remedial encasement detail which provided for the 1.5 hour rating for the completed block. Tenant communication and additional fire alarm and management presence were put in place whilst a phased programme of remedial encasement actions was completed.

Considerations
Where a system build product is proposed which is reliant on specific components and detailing being in place, the system supplier and designer should also be party to the sign off process for construction detailing. The supplier should also have been requested to provide technical support to the design team and the opportunity for review of their information. A greater extent of typical details covering fire and acoustic separation should be provided on the Architectural details and verified by the system provider. Contractually there will be no detailing design relationship with the supplier or system designer, but as in this case, their system is reliant on the performance of adjacent components, so there should be a 'duty of care' to review the later production stages of the product are in accordance with defined specifications.

In this case, the supplier and the system designer are separate entities. Where this relationship exists, the supplier and designer must both have a close working relationship with the design team and contracting organisation from the earliest opportunity.

Ⓒ COMMENTS

Structural fire resistance is an area of significant concern and considerable complexity. Structural Engineers are rarely familiar with details of fire engineering concepts, and Fire Engineers are not always familiar with structural response to fire. Involvement of the engineering team, including those who create the fire engineering strategy, should be retained throughout the project, ensuring that the detailed design and construction meet the design intent.

Structural fire resistance is an area of significant concern and considerable complexity. Structural Engineers are rarely familiar with details of fire engineering concepts, and Fire Engineers are not always familiar with structural response to fire.

Using fire engineering to reduce the period of fire resistance from the standard values (e.g. in the Technical Handbooks or Approved Documents) should be done with great care. Too often this is seen as an area to 'value engineer' without properly taking account of issues such as firefighter safety and the importance to society and the environment of preventing a building from collapsing locally or globally.

Occupant evacuation time is just one consideration when determining the degree of fire resistance to be provided by a structure. For higher consequence structures, the durations stipulated in the Technical Handbooks or Approved Documents should provide opportunity for the fire to burn out or be extinguished by the fire and rescue service, without the building reaching a state of instability.

Reducing the fire protection to the structure could lead to increased risk for firefighters and to others around the building should a collapse occur. It should be recognised that performance-based fire engineering can also be used to increase fire resistance if particular resilience objectives have been identified.

Comprehensive guidance on the matters to be taken into account when considering a performance-based fire engineering approach to structural fire protection is available in the relevant British Standards **BS 7974>** and **PD 7974-3>** (clauses 5.2 and 5.3) and other sources. To help others understand the fire strategy, the justification for any alteration in the fire resistance must be developed in association with a wide range of stakeholders, usually via a qualitative design review (QDR), documented and circulated to enable this to be properly understood and considered by the building control body and the relevant fire and rescue service.

Safety issues such as those raised in this report stem from potential confusion over both technical and contractual boundaries. The overarching lesson is that the project management process has to recognise the need for collaboration over boundaries including the final demand that one party ought to oversee the achievement of the safety standards as a whole, and thereafter verify that the as-built structure complies.

Fire resistance is part of the structural design, but given that the structural performance of proprietary SMS system rests with the supplier, it may be difficult for the Structural Engineer to verify performance from first principles. It is hoped that an experienced Engineer would recognise this detail as requiring further investigation with the specialist subcontractor. It is further hoped that future regulatory change will require there be a duty holder responsible for ensuring safety throughout projects such as this. Even better would be if the industry recognised the potential benefits and adopted such an approach prior to regulatory instruments being put in place.

Building Control bodies have a duty in law to consult with the fire brigade for all building work. The consultation should include information about the design, such as fire engineering.

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SUBMIT REPORT

SUBMIT FEEDBACK

INFORMATION

Acknowledgements

As ever, the reporters are thanked for their time and trouble in sharing these experiences for the benefit of others.

The CROSS Expert Panel are thanked for sharing their knowledge and expertise in providing comments on the reports.

958: Roof collapse at primary school

Ⓡ REPORT

This concerns the collapse of a roof at a 1960s school constructed with loadbearing masonry walls, a suspended concrete first floor, and a flat timber roof which had been re-covered in 2015. The roof comprised of new felt covering over insulation, above the old felt, and supported on woodwool boarding spanning between proprietary timber ply-box joists at approximately 1.2m centres. There was a suspended plasterboard ceiling supported by a timber framework.

The joists to the main roof had fractured at their midspan, damaging the end supports as they did so. At the time, substantial quantities of water were seen pouring out from the ground floor.

The section of roof in question was surrounded by a parapet with a hidden gutter at one end. This had leaves within it and there was debris and vegetation in the gutters and outlets to other roofs to the school. It is likely that the outlet had become blocked and water had gradually filled the roof area without being noticed.

Current codes say that roofs with access for maintenance only are to be designed for an imposed loading of 0.6 kN/m². It is considered that the dead load from both old and new coverings was within this allowance. However, if the area above the roof did fill with water, say to a depth of 250mm (the height of the upstand), there would be a sustained uniform loading of 2.5 kN/m².

Furthermore, under this loading, there would be significant deflection allowing for a further increase in loading should the area continue to fill from rainwater. The fact that it has been reported that so much water was seen passing out from the building suggests that the roof was holding a significant volume of water.

Elsewhere, there is only a small upstand surrounding the roofs and there are openings at outlet positions allowing water to overflow should there be a blockage of the outlet. The same scenario is therefore unlikely to be able to occur on the other roofs to the school.

Ⓒ COMMENTS

There have been a number of historical major collapses especially on timber roofs caused by drainage blocking / ponding and potential rot (e.g. Bad Reichenhall, Germany (2006)). The hazard of 'drainage failure' is common. Standard building practice, as in routine domestic plumbing, ought to be deployed to highlight overflow before ponding or undetected leakage can occur. The safety concept which has wide application is known as 'leak before break'. Again, as in Report 926 above, all structures are prone to degradation. Proper management requires routine inspection to detect the onset of damage before this becomes hazardous.

This report demonstrates that when designing for structural safety, a holistic view of the design should be taken. It may be that there was a maintenance issues with blocked outlets, but this possibility should have been considered and suitable overflows provided. It seems to be yet another symptom of divided responsibilities on projects, with no overall view of the impacts of the building design on the structural response.

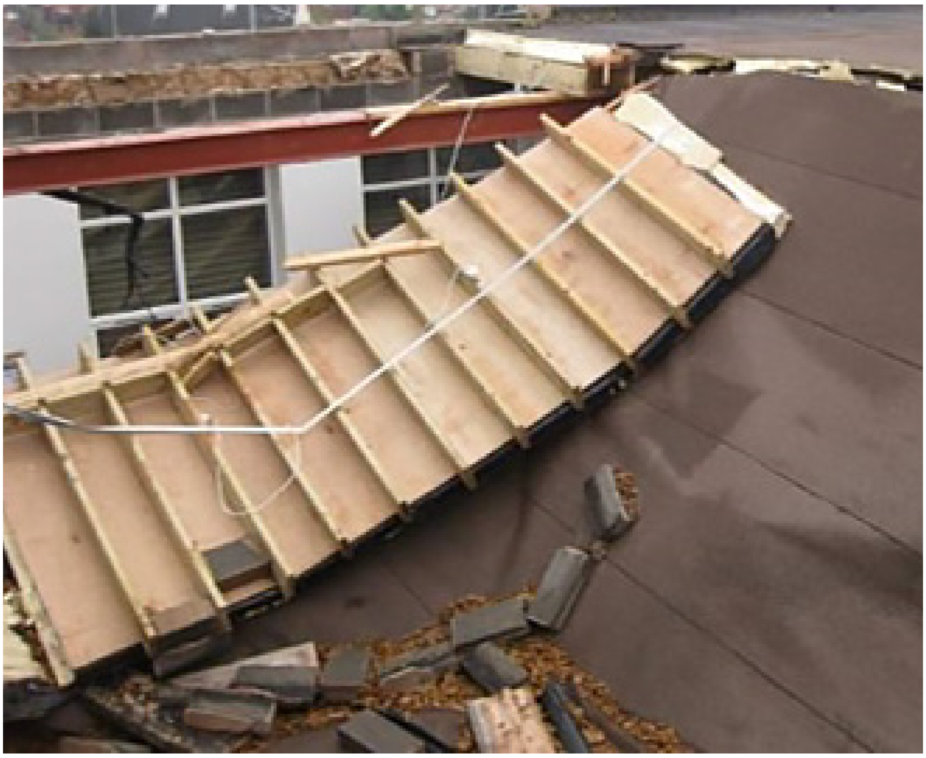

Figure 5
Collapsed section of roof

It seems to be yet another symptom of divided responsibilities on projects, with no overall view of the impacts of the building design on the structural response.

A similar report was published in CROSS-US Newsletter 1 in March 2020; **Failure to maintain roof drainage during re-roofing leads to ponding instability collapse>.**

SUBMIT REPORT

SUBMIT FEEDBACK

899: Glazing design and horizontal barrier loading

REPORT

A reporter has experienced problems in relation to evidence of compliance with barrier loading requirements on a curtain walling glazing system in an entertainment building subject to crowd loading. Enquiries made into the design of the glazed units found that the glass installed on the inside of the panels was unable to withstand the required horizontal loading, whereas the glazing on the outside of the panels could. The reporter found it difficult to obtain comprehensive design information justifying the system that was to be installed.

The deficiencies were addressed by the introduction of additional transoms at barrier height. This issue calls into question how glazing is designed and the level of scrutiny that systems are being subjected to. It is clear that the way in which critical elements are being procured and the responsibilities that are being put in place in relation to design are not being properly defined, leaving grey areas or gaps.

On the project in question, extensive use of glazing has been used along escape corridors. These corridors would be required to convey large numbers of people to safety in the event of an emergency, yet, says the reporter, the capacity for the glazing to withstand the critical load case was found to be in question. Some of the corridors and escape routes are on upper floors of the building, and on the perimeter, meaning that any failure could result in a fall from height.

It is clear that the way in which critical elements are being procured and the responsibilities that are being put in place in relation to design are not being properly defined, leaving grey areas or gaps.

COMMENTS

This is another example of problems with complex interfaces where management of the design, procurement, and construction processes must be linked. Particularly important are the boundaries of responsibilities for connection design and detailing between specialist subcontractors and the design team.

Elsewhere, there is some evidence that adequate design and detailing of critical safety structures such as balustrades is given secondary attention during the design process. It is fortunate that the reporter identified the issues before the units were subject to live crowd loading. In the past, there have been devastating failures with multiple fatalities due to inadequate barriers in sporting venues.

Glazing is quite capable of taking crowd loading if designed correctly. Glass design is however a specialist area and often the detailed design is left to the specialist contractors. The type and thickness of glass are important, but so are details such as glazing beads, sealants and gaskets. It must always be recognised that glass is a brittle material, and where it is in a safety critical location, this should be explicitly taken account of, normally by the use of laminated glass.

A useful reference is the Institution of Structural Engineers guide on **Structural use of glass in buildings (Second edition)>.**

SUBMIT REPORT

SUBMIT FEEDBACK

INFORMATION

Free e-learning module - Quality: getting it right from the start

This free e-learning module has been jointly developed by the Get It Right Initiative (GIRI) and the Supply Chain Sustainability School with funding from the Construction Industry Training Board (CITB).

It is aimed at anyone working in the built environment who is interested in reducing the risk of error.

View e-learning module>

905: Consequences of low professional fees

Ⓡ REPORT

An experienced engineer is concerned that professional fees are currently so low that engineers usually no longer attend site meetings and only pay very occasional visits to site. They say that most consulting firms would normally have allowed in their appointment documentation for an average of a visit every two weeks. This is far from ideal, in their opinion, but just about enough as there would be more frequent visits in the early stages and fewer as the work progressed.

With concerns generated by the workmanship issues raised in the Hackitt report on Building Safety **(Independent Review of Building Regulations and Fire Safety: final report)>** and by the Edinburgh Schools failures **(Report of the Independent Inquiry into the Construction of Edinburgh Schools)>**, the reporter believes that as opposed to the lessons being learned, we are actually at a stage where the level of expert inspection is still being driven down.

The **November/December 2019 issue of The Structural Engineer>** contained a letter in Verulam concerning professional indemnity (PI) insurance cover, rising premiums and greater restrictions. Clearly claims are rising as a result of failures of some sort. The letter asks why this is happening and lists possible causes, including over-reliance on computers, poor checking and poor supervision. The reporter believes that they all play a part and are often driven by low fees.

The problem engineers have is that clients are quite happy to pay the engineer less if they can, and that they are mainly interested in ensuring that the engineer has PI insurance. If things go wrong, the insurers will pay and unfortunately the engineer gets dragged in even though they may not have been directly involved.

The reporter feels that this a serious issue and that rather than chatting amongst themselves engineers need to start taking action, so they have decided to share these views with CROSS who can then raise the matter with other relevant bodies.

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Ⓒ COMMENTS

The first part of this has links with the two reports above (894 and 926) and the benefits of Engineers attending site. The second part is more difficult as it is not clear what the relevant bodies can do about fees in an open market, although it is hoped that more of a focus on competence and clearer duties may make it more difficult to undercut sensible fees.

Insurance will rarely pay the true costs of a major loss suffered by a client, and avoiding the problem from the outset is of greater value. It would be better for the industry to stipulate minimum inspection requirements. There are a number of bodies looking at this at the moment following the Hackitt report, and **GIRI (Get it Right Initiative)>** is one such group.

It is the view of many that problems are being exacerbated by design and build procurement methodology. To minimise costs, contractors are receiving designs and then asking Engineers not to attend site, whilst not appreciating the consequences of changes or shortcomings in the execution of the work which designers can positively address. CROSS believes there is a strong case for sufficient independent supervision of the works e.g. by calling the design team in to help assure adequate quality during construction. Self-certification has been shown to not work in many CROSS reports.

Clients need to realise that small additional sums expended undertaking such assurance will pay dividends in the long term through improved longevity and less maintenance. Responsible contractors should welcome this approach as it will drive upskilling, quality control and drive down the costs of rework. The industry needs client investment/ engagement to make this happen.

In CDM 2015 it says *"A client must make suitable arrangements for managing a project, including the allocation of sufficient time and other resources."* Whilst CROSS is not aware of cases where HSE has prosecuted Clients for buying too cheaply and thus not getting 'sufficient resources', the legal mechanism exists.

SUBMIT REPORT

SUBMIT FEEDBACK

902: Unauthorised structural alterations to accommodate drainpipes

Ⓡ REPORT

On a recent project under construction, a reporter became aware of cases where main structural steel sections were 'butchered' to accommodate plastic foul drainage runs. Flanges and webs were compromised significantly.

This was, continues the reporter, a BIM project and the clashes should have been picked up, but much of the detailing was passed down the supply chain to sub-contractors who had no BIM capability, meaning that the coordination of some key elements was not properly carried out in advance of construction. Furthermore, the building was a Risk Category 3 building which should have had extended supervision in accordance with Table B4 of **BS EN 1990>**.

This issue once again calls into question quality control on site and demonstrates a complete lack of understanding by those undertaking the works of the potential consequences of their actions. The defects were picked up by a routine inspection by Building Control, but it raises further questions on what else has been modified that has been covered up.

It is clear that strict protocols are required before such modifications are carried out and that there must be sign off by the Engineer before works are permitted. The lack of control on site which allows such things to prevail is evidence of questionable competency by those managing the construction process.

Ⓒ COMMENTS

This illustrates several concerns. The fact that inappropriate and potentially catastrophic changes were made to the structure illustrates the need for adequate construction supervision and independent supervision e.g. by the design team, as discussed further in report 905.

However, one must call into question why the changes were deemed necessary in the first place. Often such unauthorised alterations are made as a consequence of an uncoordinated design, where there has been inadequate interdisciplinary coordination, in this case perhaps between the structural engineer and the building drainage designer.

Clients and project managers need to give the design team the time and tools they need to ensure adequate coordination of the design, to ensure the coordinated design is constructible and without clashes. Such attention to detail usually results in significant overall cost savings for all parties. BIM should have identified the clashes and the reporter makes the valid point that sub-contractors must be party to the whole system for it to work properly.

This report also shows the valuable role that Building Control can play, because this type of situation is all too common. It also shows either a blatant disregard for safety, or a complete lack of knowledge on the part of the contractor – both situations are not acceptable in our industry. It also ties into Reports 894 and 905 above (and many other CROSS reports): what has been designed is not necessarily what has been built. A safe construction procedure should recognise that changes are inevitable but must always be controlled and sanctioned by the designer.

The fact that inappropriate and potentially catastrophic changes were made to the structure illustrates the need for adequate construction supervision and independent supervision.

SUBMIT REPORT

SUBMIT FEEDBACK

PARTICIPATION

The success of the CROSS scheme depends on receiving reports, and individuals and firms are encouraged to participate by sending reports on safety issues in confidence to **CROSS>**.

FEEDBACK

If you have any comments or questions regarding this CROSS Newsletter, please **Submit Feedback>**.

CPD PRESENTATIONS

Structural-Safety are giving online presentations to organisations who are interested in learning more about the work that Structural-Safety (CROSS and SCOSS) do, including sharing examples of safety issues to learn from.

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