

CROSS

Confidential Reporting on Structural Safety

Newsletter No. 53 | January 2019

Editorial

In December 2018 the Government issued a **Building Safety Update** on their ongoing actions following the **Grenfell Tower** fire.

This includes an implementation plan to ensure people who live in residential high-rise buildings are safe and feel safe, now and in the future. Amongst the actions are:

- A more effective regulatory and accountability framework: Addressing Dame Judith Hackitt's finding that the regulatory framework around the construction, maintenance and ongoing use of multi-occupied, high-rise residential buildings was not fit for purpose, the implementation plan outlines how the Government intends to create a stronger and more effective regulatory framework.
- Driving culture change and a more responsible industry: The implementation plan sets out measures to work with industry to drive culture change to increase responsibility for building safety, including by improving competence of those undertaking building work.
- The Government will take action to support industry as it leads the way, championing the efforts of those who are doing the right thing and challenging those who have further to go.



DIRECTOR:
Alastair Soane

Structural-Safety welcomes this commitment to reinforce safety in High Rise Residential Buildings and is working with Government to help realise these goals. Ultimately, they should apply to all occupied buildings.

In this Newsletter are examples from several sectors about how safety can be improved and, as ever, more contributions and examples will be welcome.

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

- (R)** CROSS Report
- (C)** CROSS Panel Comments
- (N)** News
- (I)** Information
- ›** Denotes a hyperlink

CROSS

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802: Fixing brackets for glazing systems

R REPORT

Over a period of a year, a reporter's organisation has been alerted to several cases of broken glass panels in a canopy at a transportation facility.

The orientation of the panels was a mix of vertical, horizontal and sloping, with failures in all orientations.

While the original cases were attributed to vandalism, an inspection report concluded that the cause might be Nickel Sulphide (NiS) Inclusion; a defect that can cause spontaneous shattering in toughened glass. However, instances of NiS inclusion are very rare, and the reporter does not believe it accounts for the number of glass breakages at the site.

As a precaution, emergency refurbishment works were carried out that have removed high risk areas of glass, replacing the majority with polycarbonate translucent panels.

During the emergency works, the reporter's organisation carried out their own inspection to see the fixings first hand and compare to the as-built details. It was observed that at least 20 of the steel fixings had come loose, leaving a number of the large 1m x 2.5m glass panels suspended near vertically from only two of the point fixings.

In addition, the glass has countersunk holes to receive the fixing bolt which, in the event of the surrounding rubber gasket failing, would result in a very thin edge of glass sitting on a steel bolt. It is the reporter's opinion that the glass breakages are a result of issues around fixing brackets. Accordingly, they are monitoring their assets with similar types of monolithic glazing.

C COMMENTS

This type of fixing is quite common and usually related to laminated glass where a sleeve is provided to minimise point load effects.

Structural glass elements typically fail due to either misadventure or poor detailing/construction practices. Additionally, the glazing panels should have been laminated as they are at height and a failure of one pane would have been held to the other by the laminating material.

The cause appears to be unknown, but one possibility not mentioned by the reporter could be repetitive wind flexing of the panels producing vibration which could cause screws or bolts to loosen. For near vertical panels the norm would be for the 2 bolts at the top of the unit to take the load and the lower bolts to be positioned so that they were not in contact with the glass to allow for differential thermal movement.

If a vertical panel is fixed at 4 supports it is possible for thermal ratcheting to occur. Thermal stress effects need to be catered for, either by design within the system or by allowing movements to occur.

The reporter is correct in raising concerns over the durability of the gasket to the connection, which can deteriorate in external environments and result in steel to glass contact. It is important to prevent such interfaces from occurring due to the generation of concentrated stresses within the glass that can lead to failure. Inspection regimes to periodically check safety-critical fixings are advisable.

"The reporter is correct in raising concerns over the durability of the gasket to the connection, which can deteriorate in external environments and result in steel to glass contact. Inspection regimes to periodically check safety-critical fixings are advisable."

I 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 which may require industry or regulatory action.

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 construction
- Possible reduction in injuries and fatalities
- Lower costs to the industry

Supporters of CROSS

- Association for Consultancy and Engineering
- Bridge Owners Forum
- British Parking Association
- Chartered Association of Building Engineers
- Construction Industry Council
- Department of the Environment
- DRD Roads Services in Northern Ireland
- Get It Right Initiative
- Health and Safety Executive
- Highways England
- Institution of Civil Engineers
- Institution of Structural Engineers
- Local Authority Building Control
- Ministry of Housing, Communities and Local Government
- Network Rail
- Scottish Building Standards Agency
- Temporary Works Forum
- UK Bridges Board

As the report explains, Nickel Sulphide failure is a rare occurrence but can occur for a decade or so after installation depending on circumstances. It is assumed that the glass on this project was heat soaked as is the norm, but this does not guarantee all nickel sulphide was found. If the glass had not been properly heat-soaked then the whole batch may be at risk. Multiple failures on one building have been observed before.

This report shows that it is important not to jump to the obvious conclusions, and to investigate properly so as not to propose inappropriate remedial works. Failure mechanisms can be complex.



[SUBMIT REPORT >](#)

[SUBMIT FEEDBACK >](#)

N NEWS

Call for information on Reinforced Autoclaved Aerated Concrete (RAAC)

SCOSS are working with the Local Government Association (LGA) in response to a recent failure of Reinforced Aerated Autoclaved Concrete (RAAC) roof slabs.

The **LGA have contacted their members >** to draw their attention to the failure and to suggest steps that they should take as a responsible body.

SCOSS would welcome information from anyone who has experienced a similar failure or has knowledge of RAAC. They can be contacted on [scoss@structural-safety.org >](mailto:scoss@structural-safety.org).

SCOSS are planning to publish more information on this topic in due course.

741: Dangerous glass infill panels on balustrade

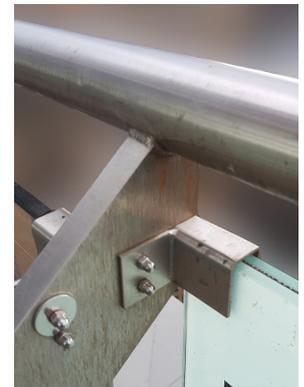
R REPORT

A reporter expressed the following concerns about the structural stability of cantilever glass infill panels between a steel post and hand rail balustrade system at a high-level apartment block:

1. The glass infill panels are set in to a mastic filled channel at the base which in places is deteriorating;
2. Some infill panels are laminated, and some are non-laminated;
3. The steel post and handrail balustrade system is not connected to the glass infill panels.

According to the reporter, in the event of a failure at the base, there is no secondary fixity to prevent complete failure of the glass sheet. The height of the apartment means that patio furniture can get blown right round three sides of the block of flats by wind. In the event of impact from the furniture, the non-laminated glass could shatter.

The reporter feels that all the non-laminated sheets of glass need to be replaced with laminated and a secondary top fixing bar in stainless steel added to exploit the existing post and rail system to hold the top of all the glass sheets given what appears to be the deterioration of the single base fixing.



● **Figure 1**
Left: Glass panel with no top restraint | Right: Restraint fitted

Remedial work was undertaken to fix the top edges of the glass sheets to the hand rail on flats with the same detail.

C COMMENTS

Safety at height is a major concern and should always be in the forefront of the mind of a designer of external components in tall structures.

Here, the glass simply cantilevers from a mastic filled channel at the base which is not a robust detail, and does not provide safety either for residents or passers-by.

Cantilevers always require care and glass cantilevers particularly so. The risk is that

if the glass breaks from impact then; firstly, there would be a large gap below the balustrade rail through which someone could fall and, secondly glass shards or granules could fall on the ground below. Another possibility would be that a panel was dislodged outwards, without breaking, but with the same consequences.

Small changes to the design would have resulted in a much safer scenario and substantially reduced the risk. The usual procedure for a designer would be to consult the **CWCT >** standards and guidelines for glazing, and the **CIRIA Guide to Glazing at Height C632 >**.

Glass is a specialist material that fails in a sudden fashion and any bespoke application should always be designed by someone with appropriate knowledge and experience. There should be discussion at the design stage to satisfy the requirements of CDM and to deal with residual risks.

"Small changes to the design would have resulted in a much safer scenario and substantially reduced the risk"

There are a number of CROSS reports about balconies which can be accessed by going to www.structural-safety.org and entering 'balcony' in the Quick Search box. Entering 'glass' in a separate search gives examples of glazing related problems.

 **SUBMIT REPORT >**
 **SUBMIT FEEDBACK >**

NEWS

Alastair Soane awarded 2018 IStructE President's Award

Congratulations to Alastair Soane, Director of Structural-Safety, who was presented with the 2018 IStructE President's Award by Faith Wainwright.

Faith chose to present the award to recognise Alastair's outstanding contribution to safety in the built environment.

[Read full article >](#)

298: Props to large excavations

REPORT

A reporter is concerned about the design of propping to large excavations and particularly about the design of the connections for a raking prop to a horizontal waler.

They have found standard guidance confusing and that opinions from other engineers differ. They therefore suggest that authoritative and detailed guidance is necessary for temporary works design.

The only useful guidance the reporter found is **CIRIA C517, Temporary propping of deep excavations - guidance on design (1999)**, where Figure 10.5 shows 'Typical end detail for a raking prop (after Goldberg et al, 1976)'. The raking prop is shown as meeting the centreline of the waler at the outer flange (the inner flange being fixed to a vertical soldier beam, which is assumed could equally be a sheet-piled wall or a contiguous piled wall).

An inclined 'kicker' or 'spur brace' is provided, presumably to resist the upwards component of the prop force which has to be resisted where the prop joins the outer flange. The idea is presumably that the horizontal force component from the prop force passes into the waler web and then along the waler to resist the horizontal forces from the soil.

Unfortunately, when the forces at the top of the prop are resolved, if the kicker is to resist the vertical force, its axial force must be similar to the prop force, unless it is extremely

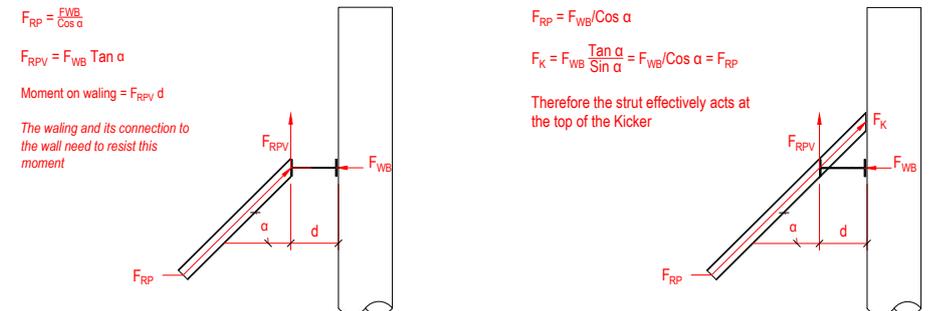


Figure 2
Raking prop to outer flange of waler beam; Left: Without kicker | Right: With kicker

steep; in fact, it is usually approximately in line with the prop.

This means (resolving forces) that the prop force passes up through the kicker to where the kicker meets the wall - and the waler doesn't spread the horizontal prop force along the wall.

There may be an alternative way of looking at this, where the soil forces travel along the waler, back into the wall at the back of the waler local to the prop, up through the wall to where the kicker meets the wall, hence into the kicker and down to the prop. However, proving such a load path would be difficult; the local wall stressing and the connections would need very close examination.

"This means (resolving forces) that the prop force passes up through the kicker to where the kicker meets the wall - and the waler doesn't spread the horizontal prop force along the wall"

The reporter has shown this to several temporary works designers. Some of them already know about the problem but some just can't see what the problem is. Solutions identified so far (and used) are to either have a near-vertical kicker (or tie-down underneath), then checking that this force can be resisted vertically, or to join the prop at the inner flange, not at the outer flange, which requires some overhead welding on site.

C COMMENTS

If forces from adjoining members do not meet at a point, then a moment will be induced and in this case the forces must be resolved to eliminate torsion on the waling.

If the junction between prop and waler beam is an assumed pin, then the system can be a structure with the eccentric vertical component of the prop creating bending in the piling (just below the waler fixing point).

Alternatively, if the prop to waler junction is assumed to be fixed, the bending will be shared between the waler and the piling. This could only work if the piling/raker have adequate bending capacity.

The reporter is correct in that, while the inclusion of a kicker provides a load path for the vertical force component of the raking prop, the horizontal force component of the raking prop will also pass through the kicker if it is aligned with the raking prop. In this case, the waler beam will not spread the prop force along the wall.

This issue can be resolved through good detailing, which could include aligning the raking prop with the inner flange of the waler. However, tolerances should always be allowed for, particularly for sheet pile walls where there can be packing between the sheet pile wall and the waler beam, so there can still be a moment. To overcome any torsional effects, stiffeners can be effective.

The **TWf** (Temporary Works Forum) are aware of the issue and are considering producing a short guidance document.



SUBMIT REPORT >

SUBMIT FEEDBACK >

N NEWS

CIRIA Guide to tower crane foundation and tie design (C761)

CIRIA published this guide in January 2019 to promote the safe design and construction of foundations for tower cranes through an improved understanding of temporary works design and health and safety issues.

This guide superceeds CIRIA's Tower crane stability (C654) guide published in 2006.

Order guide >

796: Bridge bearing design and installation – more

R REPORT

Newsletter No. 52 carried report **781 Quality of design and construction of a major bridge structure** describing problems around bearing design and installation. A reporter says that the issue of successful co-ordination between designers, contractors and specialist bearing suppliers is one they have experienced.

Report 781 focused more on the design deficiencies but the present correspondent can see that some of the issues relate to lack of "push-back" from the contractor. They are concerned over bridge installation skills and experience in the UK supply chain.

As designer and client of a steel footbridge, the reporter produced a bearing specification for tender without naming specific products. The main contractor had little bridge's experience and sub-contracted the fabrication and installation to a national supplier, who claimed to have extensive bridge's experience; although it turns out this was largely in refurbishment.

The sub-contract was worded not to include "design elements" and the sub-contractor tried to avoid proposing bearings that met the performance specification as they viewed this as "design".

After some contractual wrangling they agreed to engage with the bearing supplier. They then proposed a set of bearings which were physically too large for the bearing shelves. In the end, the reporter liaised directly with the bearing supplier to resolve the site issues.

However, there were several possible installation methods for the whole bridge which comprised several in-line spans and multiple supports. The contract stipulated that the contractor should provide an overall installation method for the bridge in advance and in writing, so that the designer could review it, and so that certain elements of tolerance and adjustment could be taken up in relevant taper plates and layers of epoxy bedding mortar around the bearings, at the relevant stages of construction.

The sub-contractor proved entirely incapable of creating a written installation method that approached a sufficient level of detail and elected to install the bearings themselves instead of getting the bearing suppliers teams to do it - for cost reasons.

"The sub-contractor proved entirely incapable of creating a written installation method that approached a sufficient level of detail and elected to install the bearings themselves instead of getting the bearing suppliers teams to do it - for cost reasons"

Upon meeting the operatives sent to site, it quickly became clear that they did not understand that the bolted guided and fixed bearings were only for horizontal restraint and would not take vertical load. They did not identify the elastomeric pads as bearings at all, asking "what are these for?".

The reporter had to provide the full installation briefing at the last minute. Successful installation of the bridge was due in significant part to luck, tolerances built into the design, and the full-time availability of the designer on site.

The reporter recommends that contracts must stipulate that bearing installation is to be undertaken by the bearing supplier themselves as "supply and install" to ensure the rest of the works are planned around getting this critical, precision operation correct. They would also tighten up the vetting process for client approval of bridge fabrication and installation sub-contractors to ensure they have the relevant skills, up to and including interviewing key staff.

"The reporter recommends that contracts must stipulate that bearing installation is to be undertaken by the bearing supplier themselves as "supply and install" to ensure the rest of the works are planned around getting this critical, precision operation correct"

C COMMENTS

A competent design was not matched by a contractor who had the necessary competence and experience.

Even with extensive design effort and communication from the designer, the execution was compromised through serious deficiencies in the supply chain (contractor/fabricator/erector). It is fortunate that these were overcome by the designer providing extensive support and supervision; beyond what should have been necessary.

It highlights once more that safety can be compromised by confusion at the interfaces between design and construction. No construction of a bridge is safe unless matched to the design overall assumptions, and this includes bearings which can accommodate the imposed forces and rotation and are properly installed. A universal safety attribute is to ensure that all design assumptions must be realised in practice.

"A universal safety attribute is to ensure that all design assumptions must be realised in practice"

Members of the site team (designer, contractor, fabricator and erector) must take ownership and responsibility for a well executed structure, as success depends not only on the right design but also the right people. Contracts should be written to facilitate this situation, not frustrate it.

The case shows again how the fragmentation of the industry and the contractual relationships are not conducive to good safe design. Having said this, where was the CDM control?



SUBMIT REPORT >



SUBMIT FEEDBACK >

I INFORMATION

Feedback on SCOSS Alert: Effects of Scale

Several readers of the SCOSS Alert on Effects of Scale have pointed out that the deflection effects on long spans are often even more sensitive to length than advised in the Alert.

Whilst it is correct that deflection is proportional to $(\text{span})^3$, if the loading is a UDL, which itself is a function of the span, then the deflection is in fact proportional to $(\text{span})^4$.

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684: Remoteness of contacts and lack of supervision

REPORT

A correspondent has been thinking about the problem of lack of supervision in construction generally and has come to the conclusion that this is all part of a wider problem, namely the general remoteness of many things; a lack of police on the beat, switchboards to take calls, tickets from railway stations, no operators' manuals for complicated tools and equipment, everything being on-line and so on. In the correspondent's view, the Professional Institutions are going the same way.

We are missing something, according to the reporter. Maybe it is trying to automate things too much as they feared in the 1930s, but the reporter thinks it is slightly worse than that. Those responsible for managing many things these days prefer to see some remote camera or other sensor and a central spreadsheet of results. The correspondent has come across this frequently with attitudes to structural monitoring; the order of the day seems to prefer sophisticated remote sensors periodically feeding back data to some central control a long way away.

Experienced eyes in the field, and immediate warnings are much more important. That is quite an obvious example of general remoteness but there are more subtle ones in construction work due to the way civil and structural engineering things are organised.

Intelligent computer systems have not really progressed beyond the Pavlovian illusion of intelligence, and too much faith is being placed in them, and promised smart solutions. What brought this to mind recently was that the correspondent was on a panel interviewing a candidate for professional membership and the question of verifying complicated calculations and adjustments to field measurements associated with a massive railway construction project came up.

It turned out that the approving body for the construction of the project only ever re-ran computer analyses of the contractor's own field observations - no mention was made of checking the field observations themselves (the fundamental things which might be wrong). What use therefore is this chain of 'approval' with a possible weak link? We have in that a clear case of a large organisation refraining from getting its hands dirty when it comes to engineering.

COMMENTS

This is an interesting report. No one should doubt that behind every failure there is generally a human action. The management of safety should assume someone will make a mistake, so all work should be checked and verified: that is office work and site installation.

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The check should be to verify that the 'model' is appropriate, that the input data is appropriate, and that the output makes sense. The checker should think hard about what has been omitted or overlooked.

However, modern technology offers huge advantages in structural monitoring that did not exist before. So, we need to assess how to make best use of them: the reality will be there just isn't the manpower to monitor everything. But there is no point in collecting data if it is not processed or acted upon. In 1994 the **collapse of the Heathrow tunnel** was partly due to no one acting on the mass of (ground movement) data collected and which was an essential component of NATM tunnelling methodology.

It is worth mentioning the Reason's Plates (Swiss Cheese) model in terms of management. The point is that no system can be allowed to have a single point of failure (single slice of Swiss Cheese). Also, multiple 'slices of cheese' need true independence otherwise the holes will align and two is no better than one. Reason's analogy can be applied to management systems just as much as to safety control systems.

Alerts from remote monitoring should trigger discussion among the engineers involved about the likely causes. Competent engineers must interpret remote collected data, at least until there have been much greater improvements in artificial intelligence. Whilst the reporter thinks that the checker should have independently checked the site data, it is unlikely that

was ever in their scope. Maybe the more fundamental question is how major projects are set up such that the responsibilities for design, construction and checking are robust and reliable.



[SUBMIT REPORT >](#)



[SUBMIT FEEDBACK >](#)

NEWS

CROSS-AUS Newsletter No. 1

CROSS-Australasia published their first Newsletter in December 2018.

[Download CROSS-AUS Newsletter >](#)

You can sign-up to the CROSS-AUS mailing list for email updates from CROSS-AUS at the link below.

[Sign-up to the CROSS-AUS mailing list >](#)

761: Major UK steel manufacturer talks about steel substitution

R REPORT

A correspondent has written in response to the issues that have arisen from CROSS report **740 Common use of S235 cold rolled steel instead of S355 hot rolled steel**>. As a UK manufacturer of both hot and cold structural hollow sections, they are concerned that cold formed S235 steel is being used in place of hot formed S355 steel, as this can have dangerous implications.

In their view, there is good availability of both cold and hot formed steel in the UK and they feel that a few may be letting the industry down. They refer to the **Hot v. cold formed hollow sections**> article published in The Structural Engineer in 2007 on the comparison and effects of hot and cold structural hollow sections and ask if this article should be re-issued with the addition of CE marking to help the industry?

The correspondent notes that S235 is generally manufactured for the commodity industry and therefore does not require the same quality, traceability and testing as S355, so will have a price difference. The two product standards, EN10219 Cold formed Structural Hollow Sections and EN10210 Hot finished Structural Hollow Sections, are different.

The correspondent has come across the substitution of S235 for S355 but is very alarmed that this is happening with cold S235 for hot finished S355. Material manufactured to EN10219 and EN10210 will be CE marked, and there should be a clear identification with the certificate and label that goes with the steel.

The correspondent goes to say that if there are any issues arising from the mis-use or mis-selling, then the responsibility lies with the person/company placing the product in the market place.

The main problem, they believe, is that the tested values of the cold EN10219 will be much higher than the minimum yield certified due to the manufacturing process but will lose yield when heat is applied. The people responsible for up-grading are playing a dangerous game.

C COMMENTS

A key safety message that CROSS comments keep repeating is that there should be verification that what is built matches design intent.

There can be no more serious deficiency than having a material that doesn't have the strength the designer thought it had. A rather obvious issue is that you can't tell the difference in strength between two pieces of steel (or concrete) just by looking at the product. Therefore, QA on product procurement (and QC) are essential components in assuring design safety.

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There are issues around the whole construction industry regarding substitution of materials (usually for something cheaper), the clear marking of products and the availability and ability of someone to check. If components and materials are marked clearly (and accurately), and there is rigorous checking on site then these things can be avoided.

The matter of false certificates has previously been addressed by SCOSS in the Alert **Anomalous documentation for proprietary products - February 2013**>.



SUBMIT REPORT>

SUBMIT FEEDBACK>

N NEWS

SCI Advisory Desk Note 424 - Shear stud length

SCI has been advised that shear studs which are shorter than usual have been placed on the market in the UK, and their note warns against using them unless the length has been reflected in the design, and unless the studs meet the necessary material specification.

Read Advisory Desk Note 424>

757: Lack of method statements on domestic projects

REPORT

On a number of occasions, a reporter has observed that where an opening is being formed on domestic properties for, say a rear extension, that the builders tend to remove the masonry and follow up with the temporary propping.

This method tends to cause a significant amount of disruption to the structure which must be remedied after the cracking appears. On domestic contracts, the works are usually barely specified, and it's left to the builder to come up with a method of work.

A detailed description of the propping requirements is necessary to counter this issue either in the margin notes on the general layout drawings or in the specification if there is one.

COMMENTS

Domestic projects are often procured directly with the builder, by a householder who has not the knowledge or experience to be able to procure or properly specify the works.

The householder is only looking at the final result, and the builder has to ensure it is done in a safe way. There is no qualification or experience requirement for anyone to call themselves a builder. Often there is no engineer involved at all, and if there was one at the design stage they are not present during construction.

It is however the responsibility of the builder to design any temporary works to ensure that the structure is undamaged.

As always, on any project big or small, a proper design should envisage how the structure is going to get from where it is 'now' to where the finished design envisages it to be. The general position is that dangers of instability exist in all intermediate stages. There have been significant bridge failures because of overlooking this reality never mind domestic opening up.

Whether the work is domestic or non-domestic, it should be properly planned and carried out in a safe manner. Regardless of the type of project, builders should have the appropriate skills, knowledge, experience and training for the tasks they are undertaking.

The Health and Safety at Work etc Act 1974 applies just as much to domestic projects as it does other workplaces (unless it's DIY) and CDM 2015 has brought domestic projects in scope where previously they were exempt from certain duties.

The Federation of Master Builders has published [Licence to build: A pathway to licensing UK construction](#) which makes the case for builders to be licenced.



[SUBMIT REPORT](#) >

[SUBMIT FEEDBACK](#) >

NEWS

Lessons from the Eindhoven Airport parking building collapse

The Dutch Safety Board have published a report on the partial collapse of a new multi-storey car park at Eindhoven Airport.

It makes for sobering reading and the recommendations are very similar to many of those in the Hackitt report.

[Download report](#) >

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 [Structural-Safety](#) >.

FEEDBACK

If you have any comments or questions regarding this CROSS Newsletter, please [Submit Feedback](#) >.

CPD PRESENTATIONS

Structural-Safety are giving lunchtime 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.

For more information contact events@structural-safety.org.

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