CROSS
COLLABORATIVE REPORTING
FOR SAFER STRUCTURES

BOF
Bridge Owners' Forum

Safety Report Examples

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CROSS safety reports

CROSS Safety Report

Concerns over execution class categorisation of steel pedestrian bridge

Report ID: 1149 Published: 21 November 2022 Region: CROSS-UK

Overview

A reporter is concerned in respect of the steelwork execution class, and quality management arrangements, applied to the construction of a public access pedestrian bridge.

Key Learning Outcomes

For clients specifying bridgeworks:

- Observe established technical approval processes
- Consider the advantages of a single controlling mind to oversee design

For building and bridge design engineers:

- Specify the execution class or classes for the whole structure
- Consider independent audit of fabrication for some structures

Full Report

▸ Find out more about the Full Report

A steel pedestrian bridge specified as requiring construction to execution class 3 (EXC3) was fabricated by a steelwork contractor certified to EXC3, however, the reporter is concerned that insufficient monitoring and due diligence were undertaken of the contractor's work in fabricating the bridge.

The reporter is also concerned that one support for the bridge was included in an adjacent steelwork package which was undertaken by a steelwork contractor certified to execution class 2 (EXC2). The reporter believes that the whole of the bridge, which provides public access, including any supporting steelwork, should have been constructed by a steelwork contractor working to EXC3.

Expert Panel Comments

▸ Find out more about the Expert Panels

Bridges in the UK are usually required to be constructed to execution class 3 (EXC3) whereas buildings are often required to be constructed to execution class 2 (EXC2) or indeed EXC3 for some higher-risk buildings. The execution class defines a set of quality and assurance controls for the fabrication process. The higher execution class includes more stringent requirements. Specifying the right Execution Class – newsteelconstruction.com provides a background to execution classes and selecting the right level of quality and assurance controls needed to ensure a structure meets the engineer's design assumptions.

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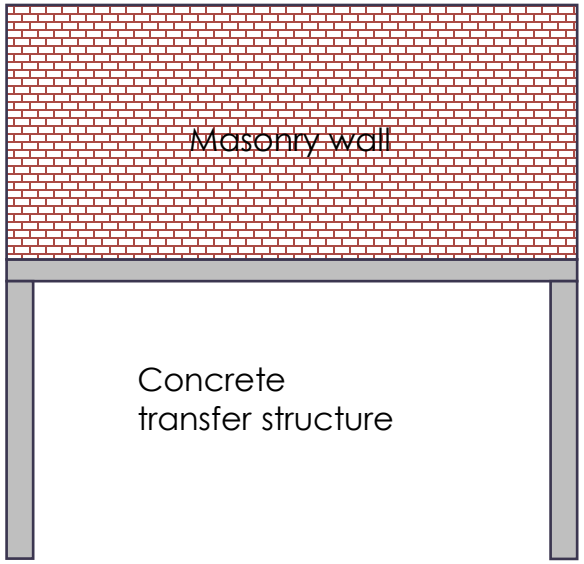
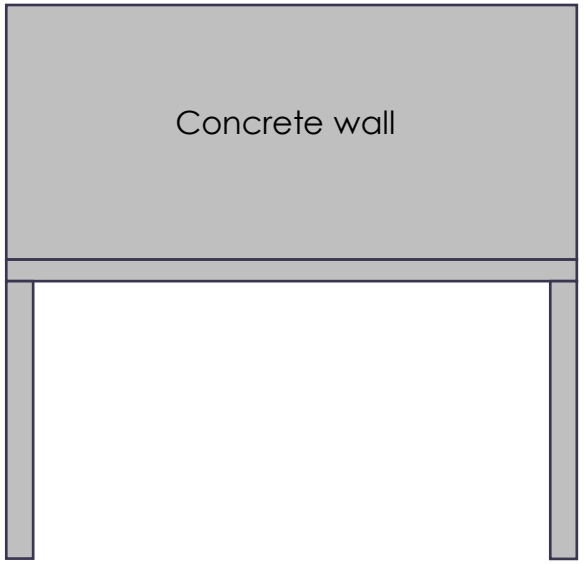
Unconservative design of flat slab due to software modelling issues (ID 886)

CROSS safety report example

Unconservative design of flat slab due to software modelling issues (ID 886)



What was required to be modelled.



What was modelled.

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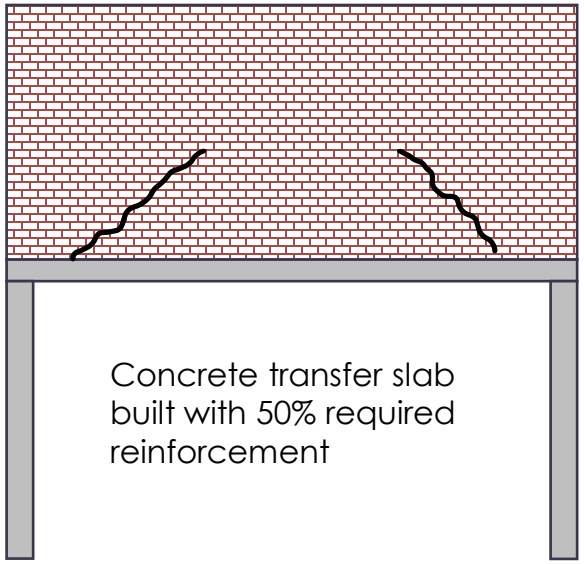
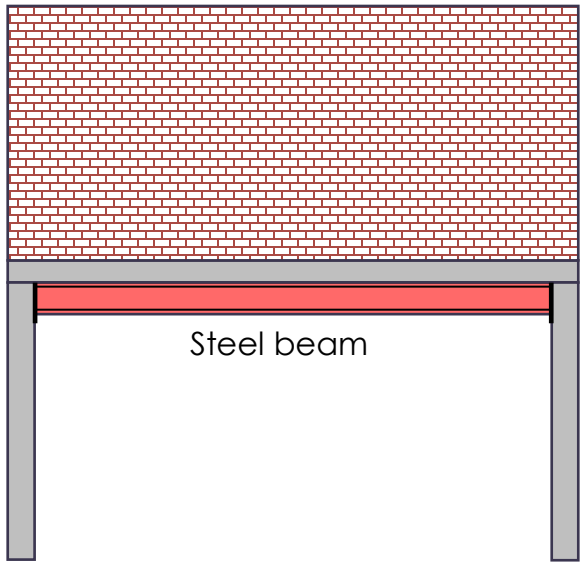
Unconservative design of flat slab due to software modelling issues (ID 886)



What was built.



Remedial Works.

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Unconservative design of flat slab due to software modelling issues (ID 886)

Key Learning Outcomes

For civil and structural design engineers:

- If there is uncertainty with design outputs from a design software it is good practice to carry out hand calculation checks to verify the outputs
- Ensure that those using specialist software programs are suitably trained and competent to do so
- It is good practice to have in-house checking of designs carried out by a competent and experienced engineer. Particularly for critical elements such as transfer slabs.

Dangerous alterations to steel beam supports (ID 479)

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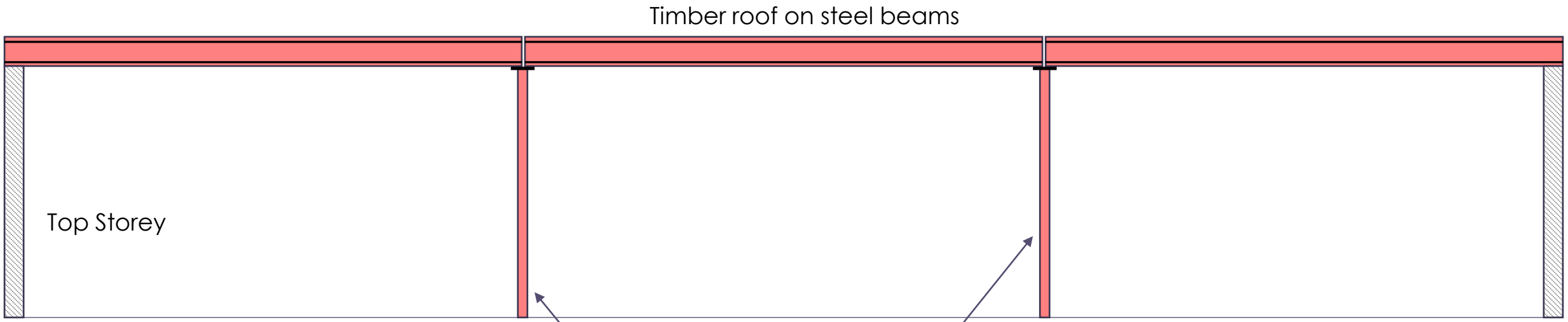
Dangerous alterations to steel beam supports (ID 479)



Existing Cross-Section

Proposed Works:
Relocate steel columns
with revised steel framing

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Dangerous alterations to steel beam supports (ID 479)

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Dangerous alterations to steel beam supports (ID 479)

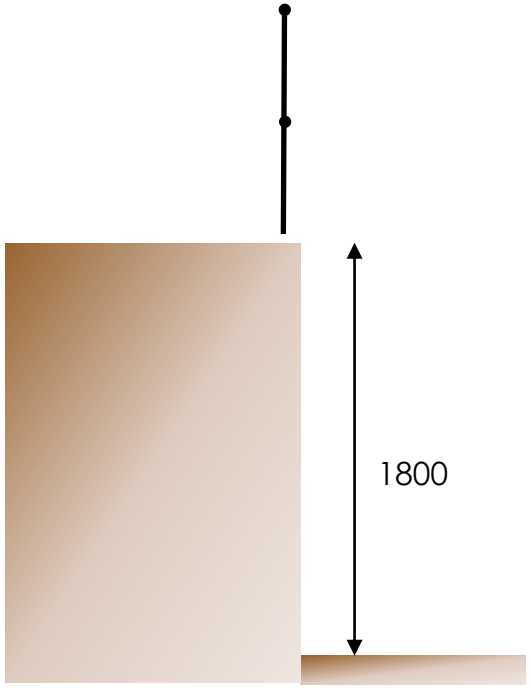
Key Learning Outcomes

For construction professionals:

- Quality control and competent supervision on site can help to ensure that the structure is built in accordance with the design
- Effective communication of essential design information in an accessible form to tradespeople working on site can also ensure the works are in accordance with the design intent
- Consider appointing a competent temporary works coordinator (TWC) on site who can ensure all temporary works are carefully considered and planned

Dangerous design of a retaining wall (ID 989)

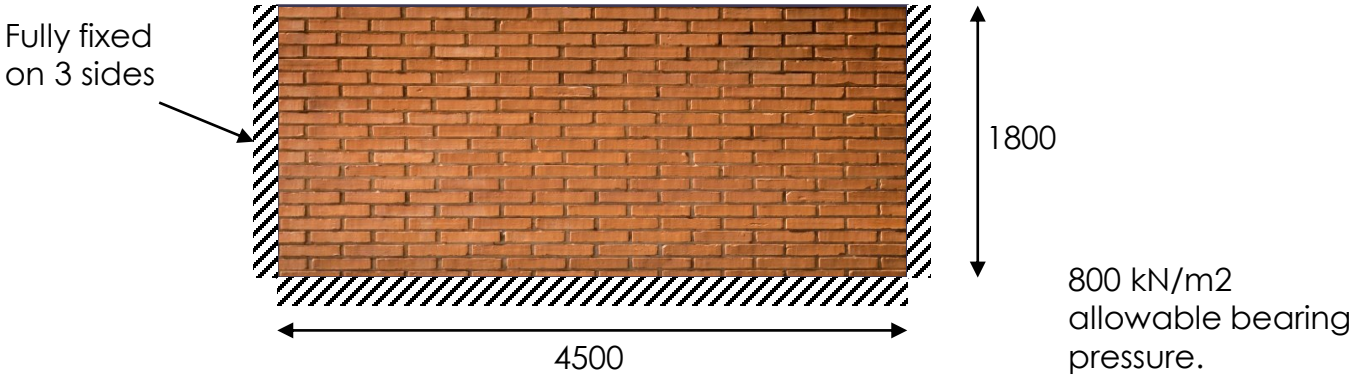
CROSS safety report example
Dangerous design of a retaining wall (ID 989)



What the client required

The concept: A brickwork retaining wall

What was computer modelled:



Design submitted for approval:

- A 215 thk brickwork wall with movement joints at 4500 centres.
- A foundation on compacted fill with an assumed bearing pressure of 800kN/m2
- No consideration given to the parapet guard rail or fixings.

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CROSS safety report example
Dangerous design of a retaining wall (ID 989)

Key Learning Outcomes

For civil and structural design engineers:

- A quality assurance system within your organisation, that includes the internal checking of calculations, can help prevent safety issues with computer programs from occurring
- Competent supervision of design by experienced personnel can allow less experienced engineers to develop a feel for the right solution
- It is good practice to carry out sense checks and validate all design outputs from proprietary design and analysis software
- The importance of validating software is noted in the Institution of Civil Engineers Civil Engineering Journal August 2013 The importance of understanding computer analysis in civil engineering, and in the Standing Committee on Structural Safety (SCOSS) Topic Paper 2018 Reflective Thinking

For the construction team:

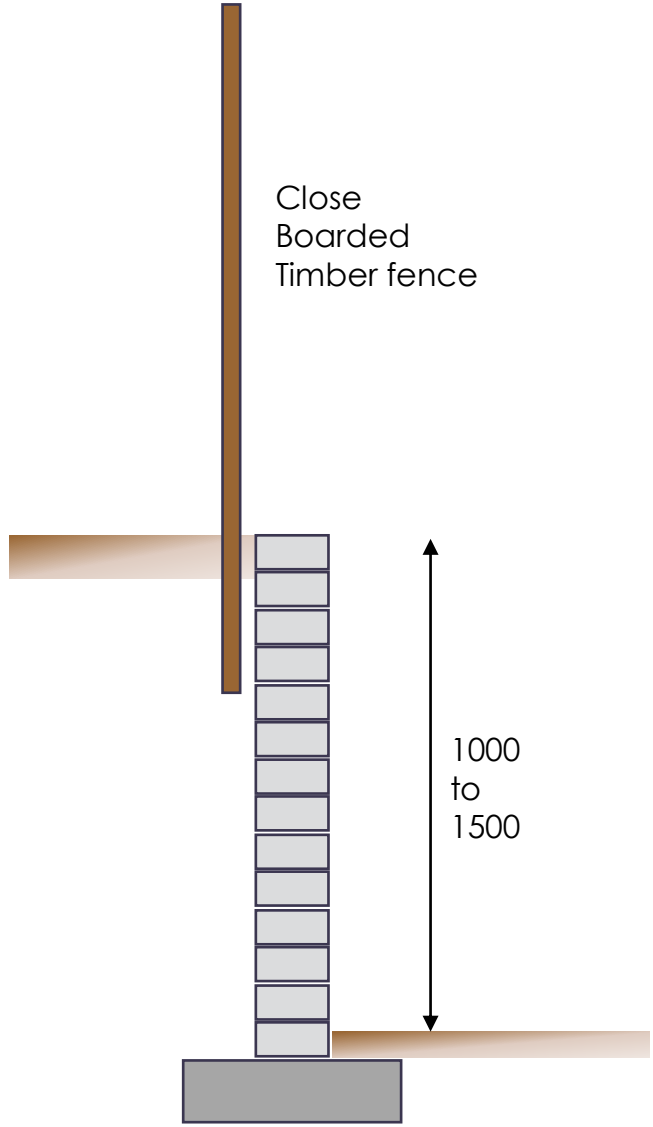
- There have been numerous failures associated with freestanding masonry walls and a previous Alert was issued by SCOSS – Preventing the collapse of freestanding masonry walls

For clients:

- This report demonstrates the value and importance of technical acceptance checking in mitigating safety issues within a client organisation

Boundary Retaining Wall Collapse (ID 1119)

CROSS safety report example
Boundary retaining wall collapse (ID 1119)



Section Through Wall

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CROSS safety report example
Boundary retaining wall collapse (ID 1119)

Key Learning Outcomes

For the construction team:

- Be aware of any level changes on-site and the need for retaining walls
- For the design of retaining walls, seek the advice of a competent structural or civil engineer
- The addition of a fence on top of a retaining wall will need to be considered within the design

For civil and structural engineering consultants:

- Design retaining walls in accordance with good practice and refer to the references in this report if in doubt

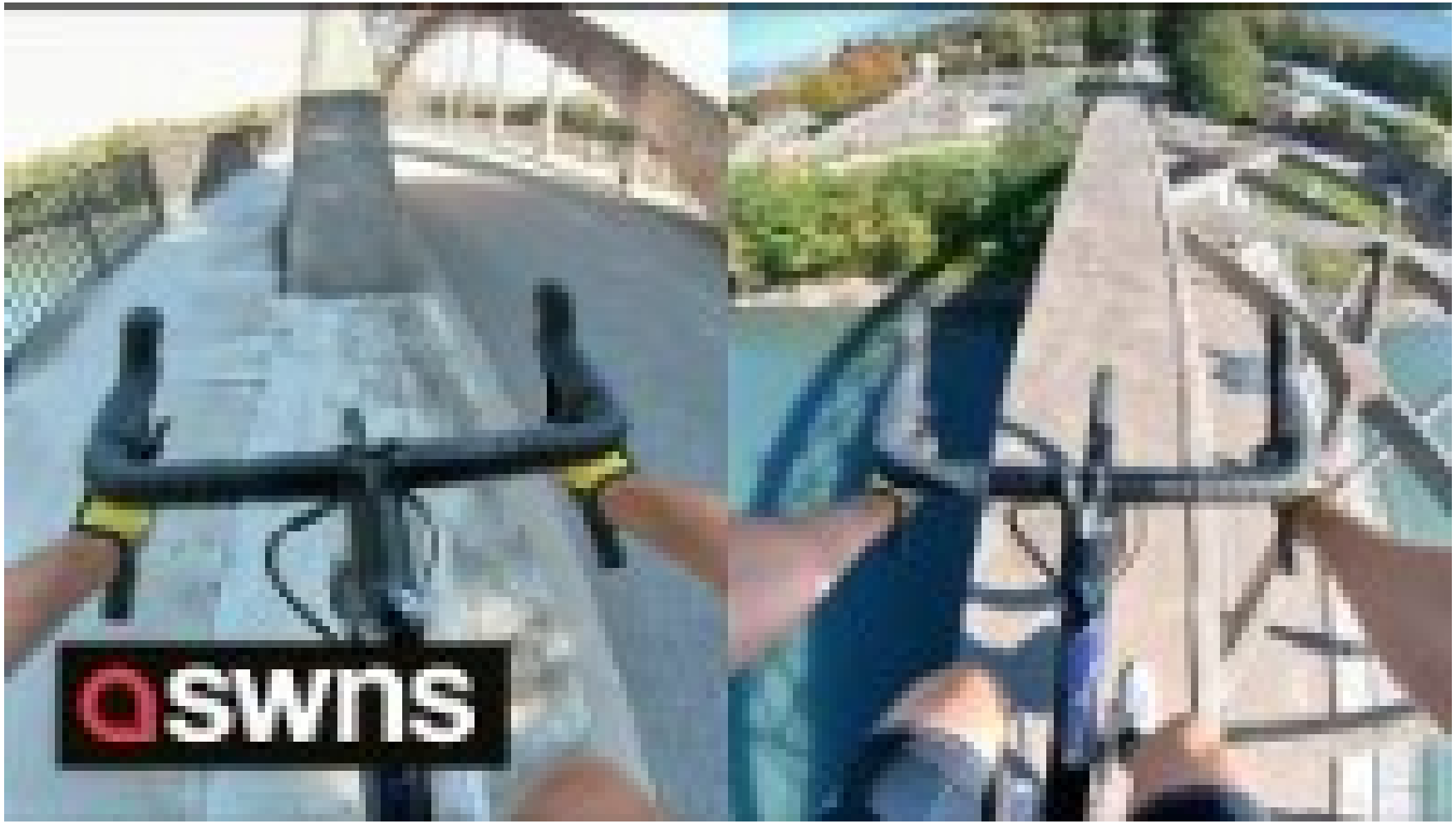
For the client:

- Ensure that a competent engineer is appointed to undertake the design of any retaining walls
- Note that there have been numerous failures associated with freestanding and retaining masonry walls with serious consequences. A previous Alert was issued by the Standing Committee on Structural Safety (SCOSS) –Preventing the collapse of freestanding masonry walls.

Stunts on bridge cause concern (ID 1136)

CROSS safety report example

Stunts on bridge cause concern (ID 1136)



CROSS safety report example

Stunts on bridge cause concern (ID 1136)

CROSS safety report example

Stunts on bridge cause concern (ID 1136)

Key Learning Outcomes

For bridge design engineers, architects and their clients:

- Designers, clients, operators and users should contribute to risk assessments that consider inappropriate access
- Address inappropriate access early in the design process
- Consider if disciplines outside of engineering could contribute to the consideration of mitigation measures
- Be aware that mitigation measures may need to be adapted over the service life of a structure
- Designers should stay alert to how designs can develop to best serve society

Balcony walkway collapse at block of flats (ID 341)

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Balcony walkway collapse at block of flats (ID 341)

Balcony tragedy
Angers, France (2016) – 4 fatalities

Unsafe design of a retrofit cantilever balcony (ID 1128)

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Unsafe design of a retrofit cantilever balcony (ID 1128)

- Balcony resin-bolt fixings into 100mm wide brickwork.
- Problem identified to multiple units
- Bolt tension loads ignored!
- Bolts were found to be considerably overloaded for embedment depth and material.
- Inadequate oversight by an experienced engineer.

CROSS safety report example

Unsafe design of a retrofit cantilever balcony (ID 1128)

Key Learning Outcomes

For structural and civil design engineers:

- Retrofitting balconies to cavity wall construction is fraught with difficulty
- Guidance, oversight and validation are essential to help design talent develop and produce competent designs
- CROSS Safety Alert *The management of design related risks: structural civil and fire engineers* considers design risk management
- The acceptability of critical fixings should be examined at the design concept stage

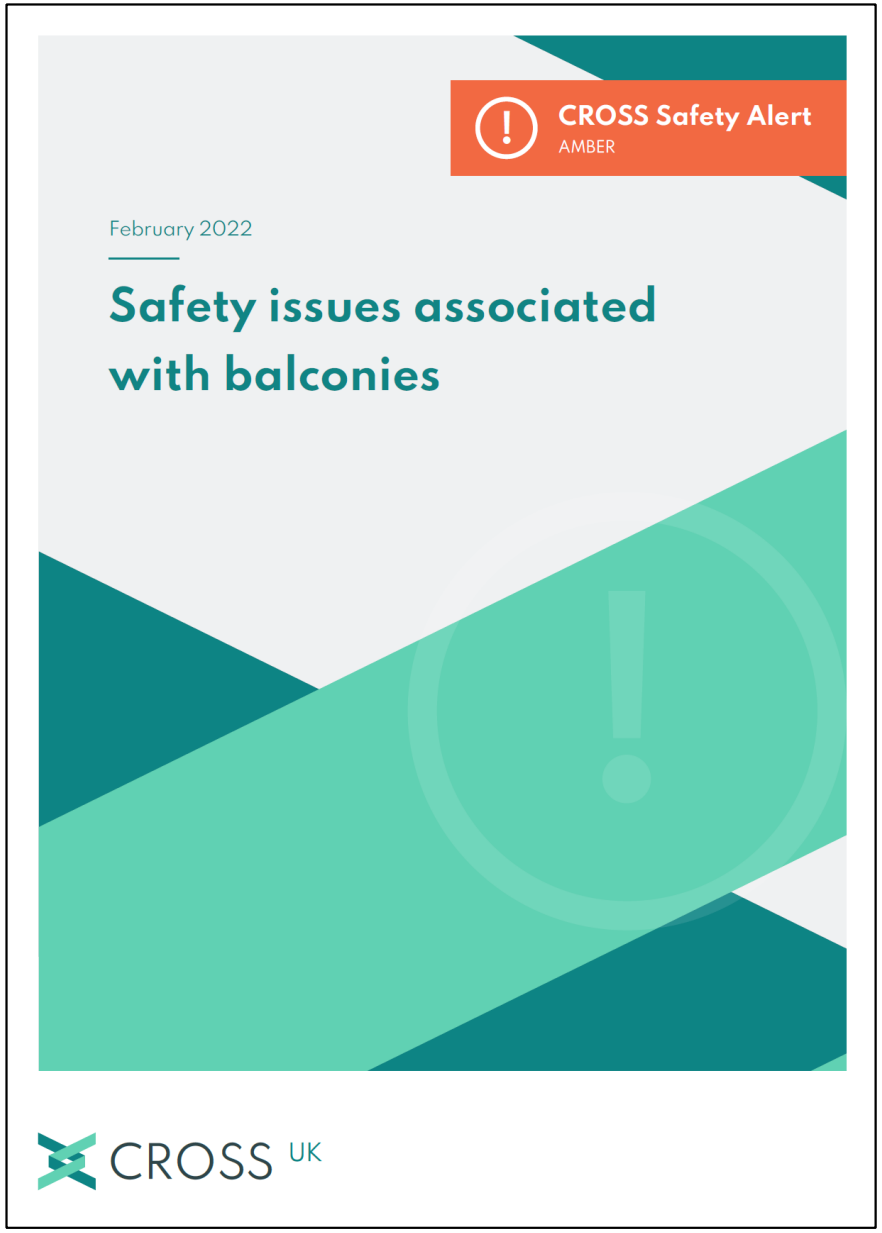
For clients, architects and all design professionals:

- CROSS Safety Alert *Safety issues associated with balconies* provides general safety advice concerning balconies
- *Designers* and *Principal Designers* have responsibilities under Construction (Design and Management) Regulations 2015

CROSS safety alert

Safety issues associated with balconies

Balcony collapse in Berkeley, CA, leads to 6 fatalities



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Thank you

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