Bridge Owners Forum

Structural-Safety

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January 2018

Structural-Safety Group

SCOSS

Standing Committee on Structural Safety

- Founded 1976
- Collects data from public sources
- Does unacceptable risk exist?
- Publishes Alerts and Topic Papers

CROSS

Confidential Reporting on Structural Safety

- Started 2005
- Collects confidential data
- Provides comments on lessons to be learned
- Maintains report database
- Publishes Newsletters

Voluntary committee and panel members

Pyramid of Risk

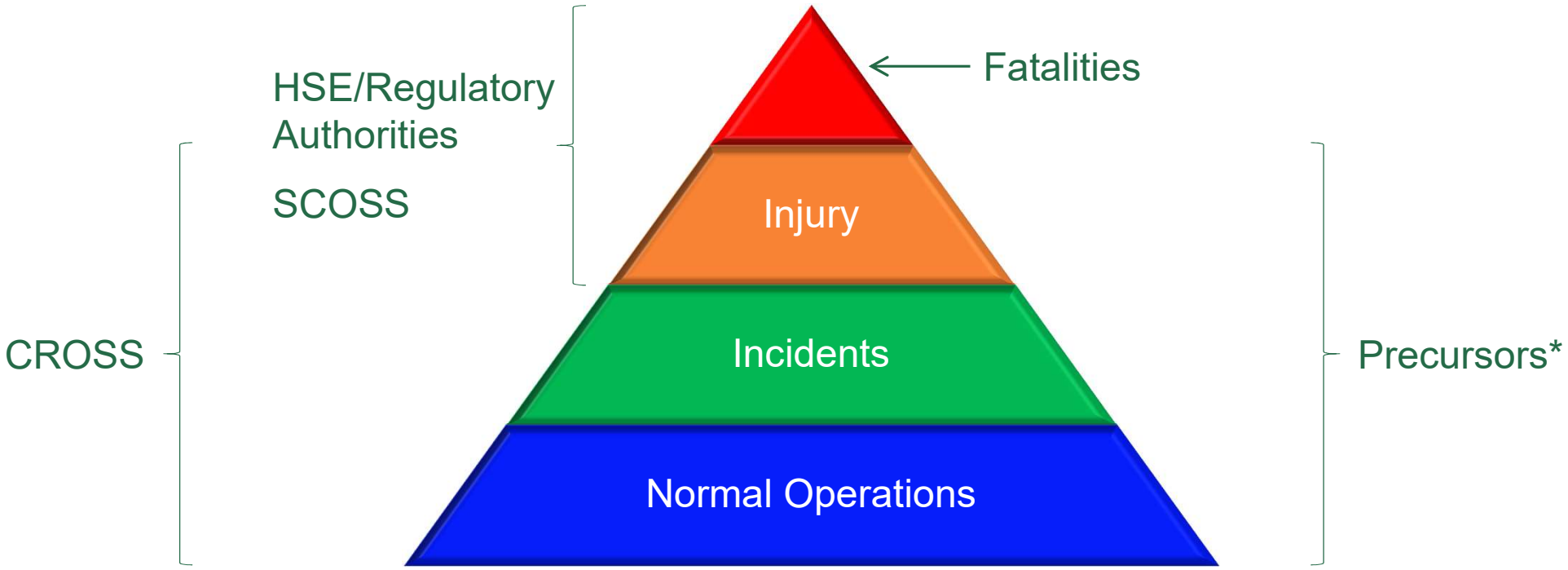
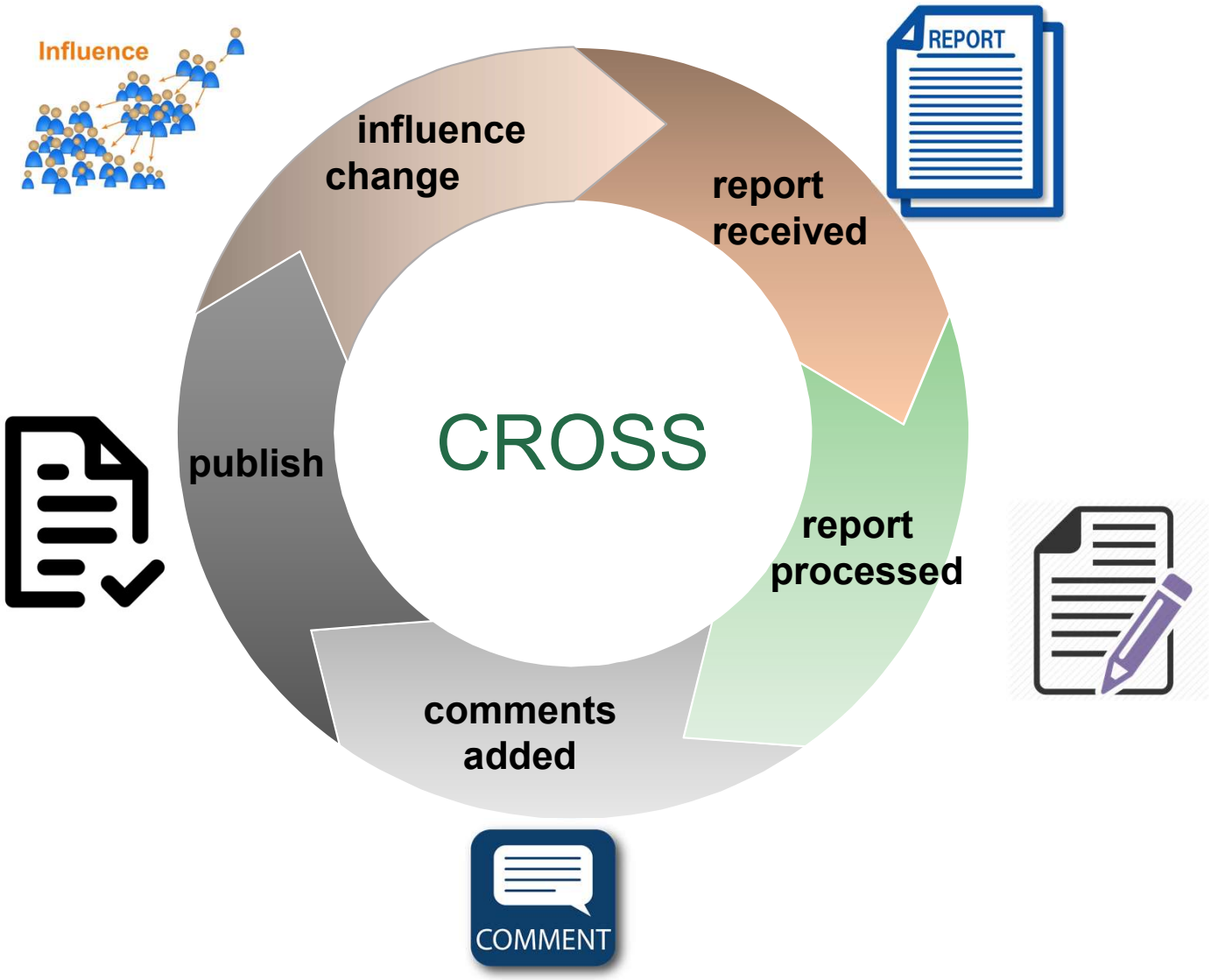
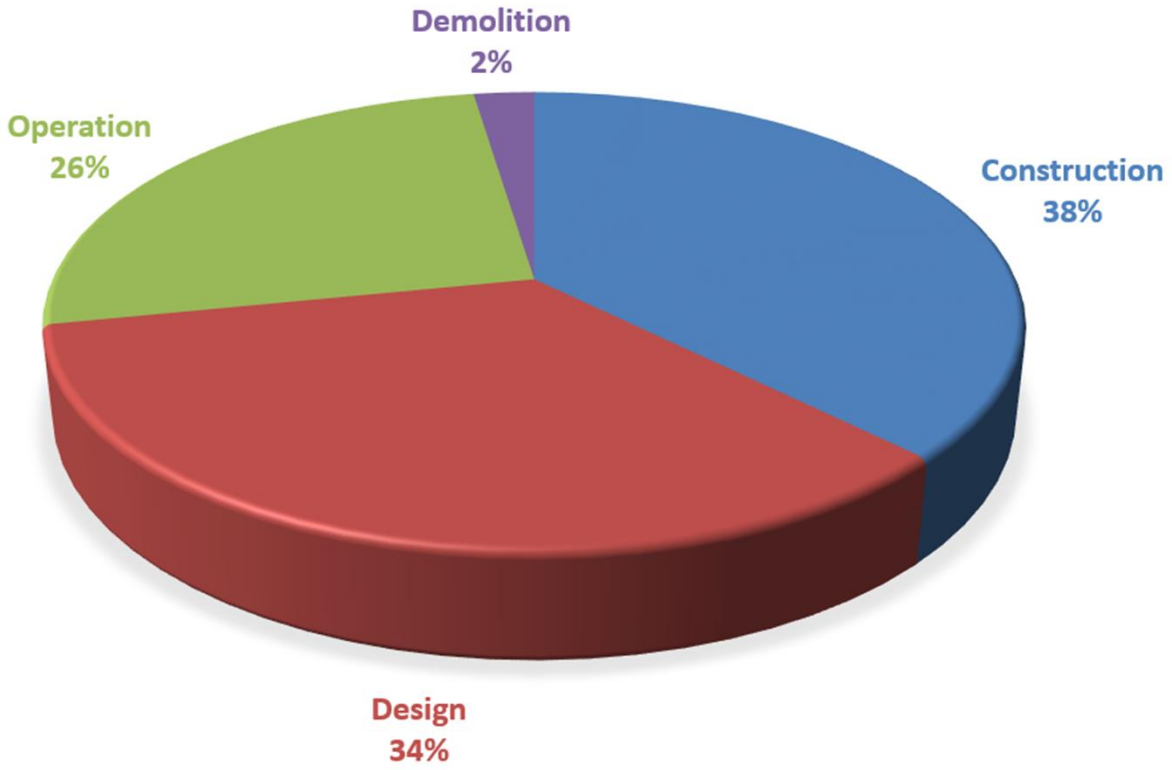


Diagram courtesy of ASRS

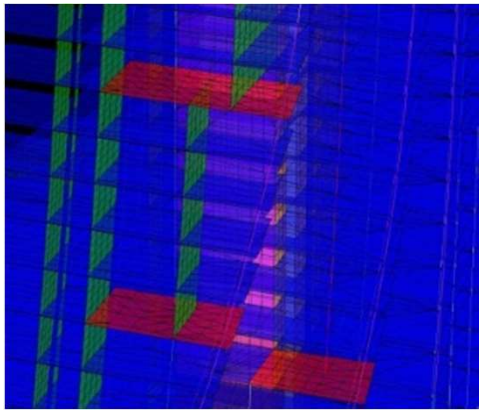
* Precursors should be reported internally and can be reported to CROSS


Influence
influence
change
report
received
REPORT
CROSS
publish
report
processed
comments
added
COMMENT

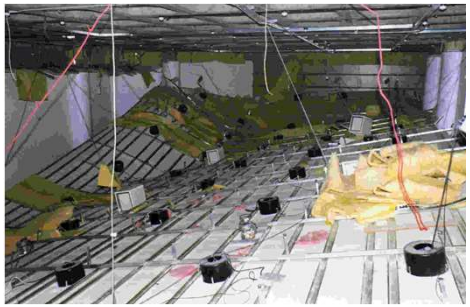
CROSS Reports - Concern About



From Temporary Works to Demolition

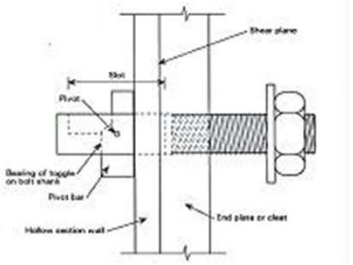


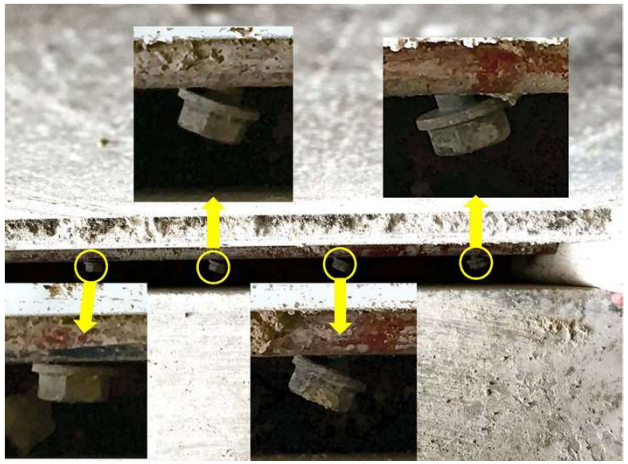
Fixing Failures



Numerous reports

Holding down nuts

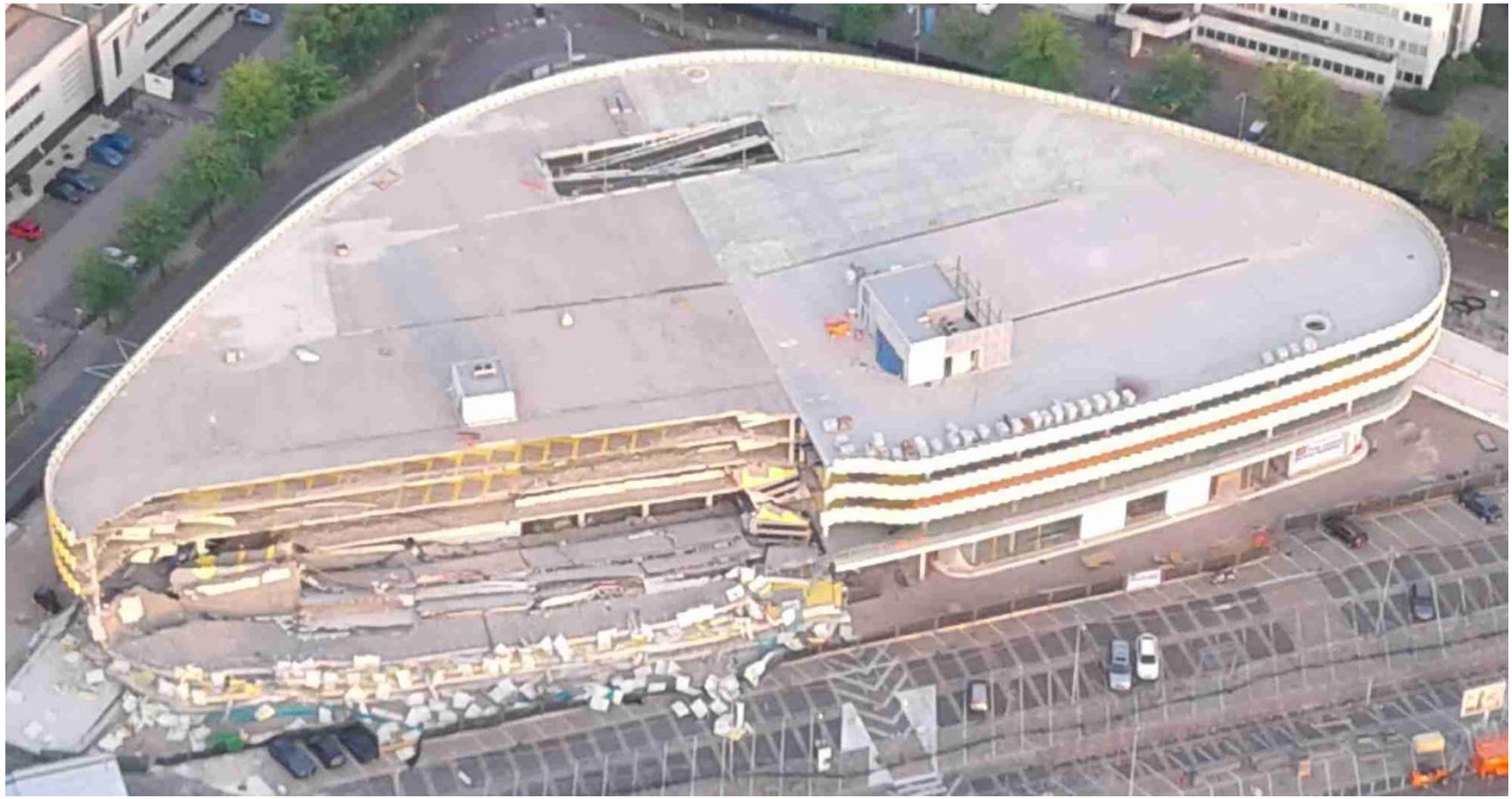




Balcony Collapses

No rebar in
top of slab

Eindhoven Airport Car Park - 2017



Poor Practice on Temporary Stages

Lack of stability

Precursors

Lack of anchorage

Indiana Stage Collapse - August 2011

International SCOSS Alert issued

DJ killed, others injured in stage collapse at Brazilian dance music festival – December 2017

City Gates - SCOSS Alert
Structural Stability/Integrity of Steel Frame Buildings

City Gates - SCOSS Alert
Sudden Collapse

Edinburgh Schools - 2016

Inquiry Into the Construction - SCOSS Alert

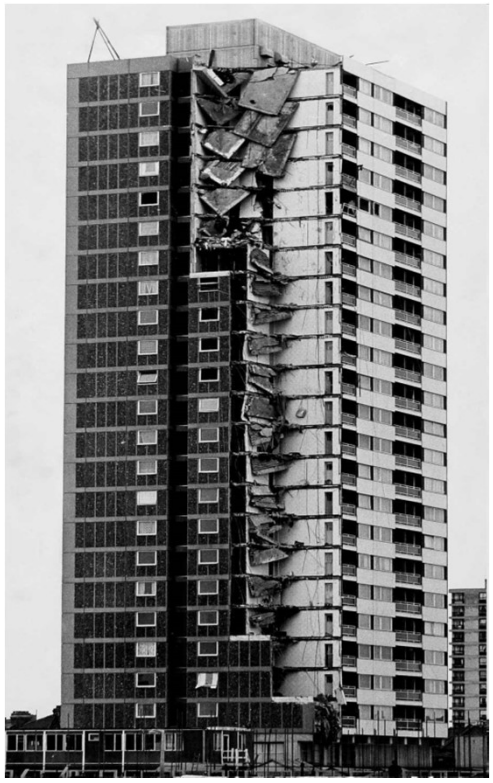
Wide ranging Inquiry

Defects found at 72 more Scottish school buildings

New Ferry Properties - March 2017

New Ferry Properties - Gas Explosion

Tower Block Tragedies



Ronan Point 1968

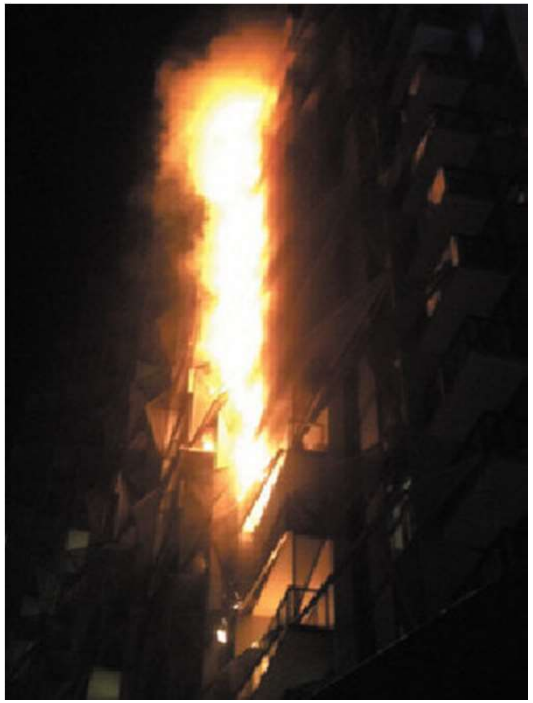
Grenfell Tower 2017

Systemic Issues

Edinburgh	City Gates	Grenfell	CROSS
• Client's role	• Client's role	• Client's role	• Yes
• Detailing	• Detailing	• Product choice	• Yes
• Sub-contractors	• Sub-contractors	• Sub-contractors	• Yes
• Brick laying	• Steelwork fabrication	• Cladding and insulation	• Yes
• Lack of supervision	• Lack of supervision	• Supervision?	• Yes
• Building regulation approval	• Building regulation approval	• Building regulation approval	• Yes
• No Clerks of Works	• Clerk of Works?	• Clerk of Works?	• Yes

Lack of awareness of potential consequences

Cladding Fires

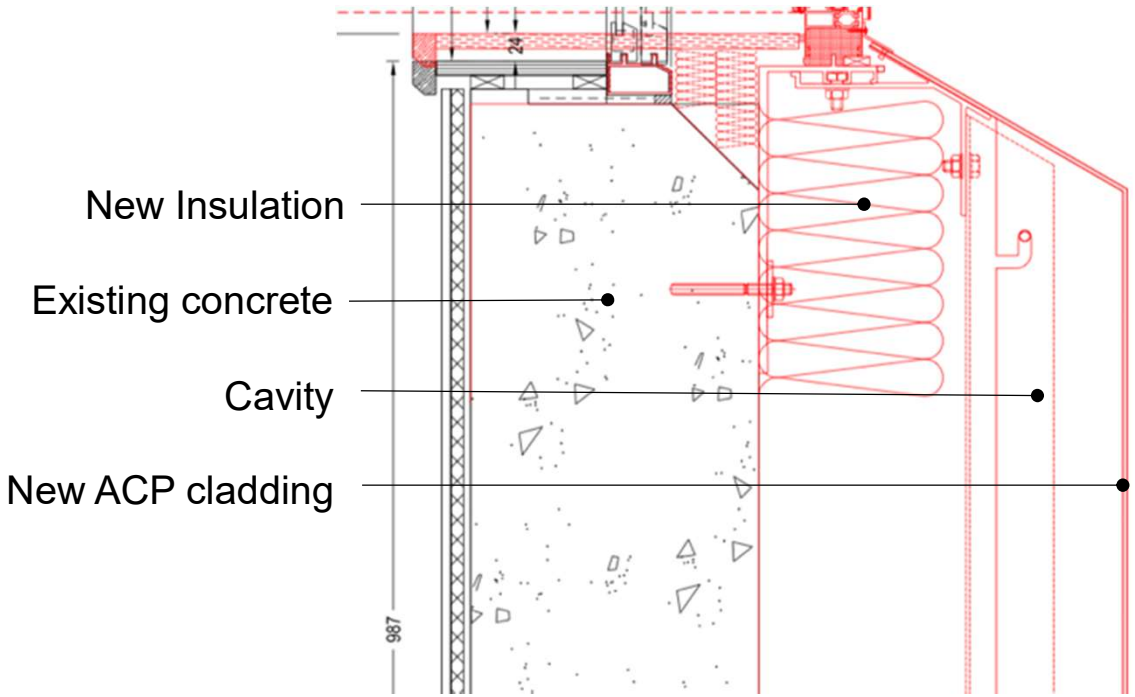


Lacrosse Tower
Melbourne 2014

Dubai hotel 2015

Precursors

Current DCLG Sampling/Testing
>181 ACP Cladding Samples Tested (to date)

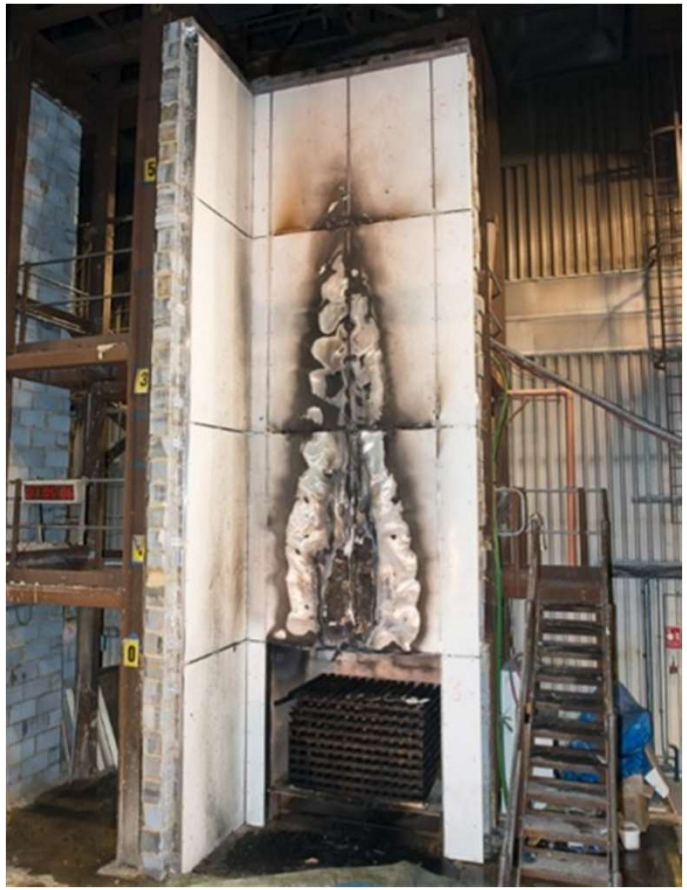


DCLG/BRE Fire Tests

Test No. 1 Stopped After 395 Seconds - Failed

100 mm rigid polyisocyanurate (PIR) foam insulation boards

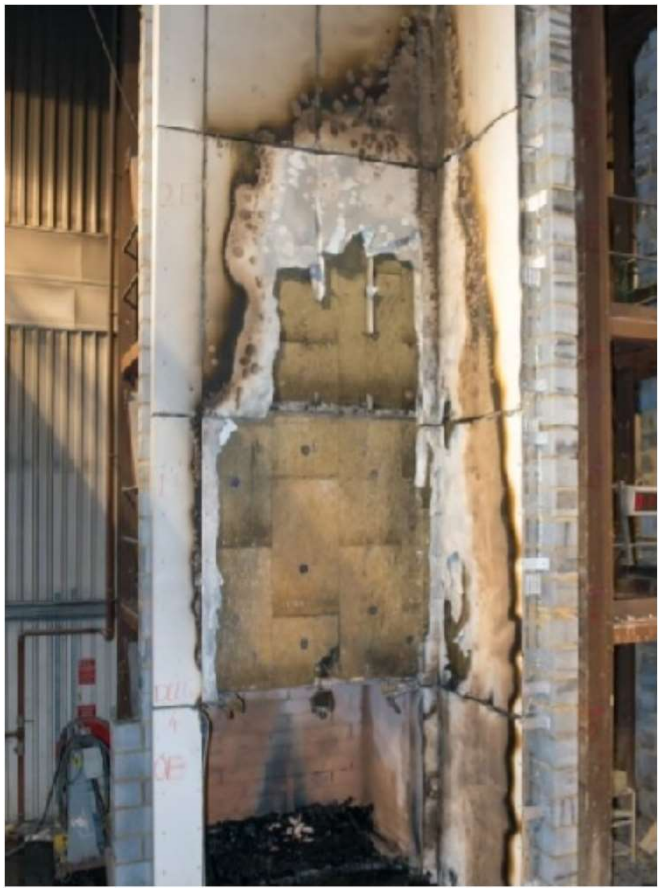
4mm aluminium composite material (ACM) panels with polyethelyne (PE) filler



Test No. 4 Stopped After 1 Hour - Passed

180mm stone wool
insulation board

4mm ACM panels
with fire retardant filler



Lessons from Previous Failures

- Catastrophic failures are a constant threat
- Primary cause is usually failure in leadership
- Competency is assumed but is not always present
- Cost cutting is often an ingredient
- Poor designs, poor construction, poor management, poor communication and poor maintenance all contribute
- Learning from precursors can prevent future failure events

Judith Hackitt review: building a safer future

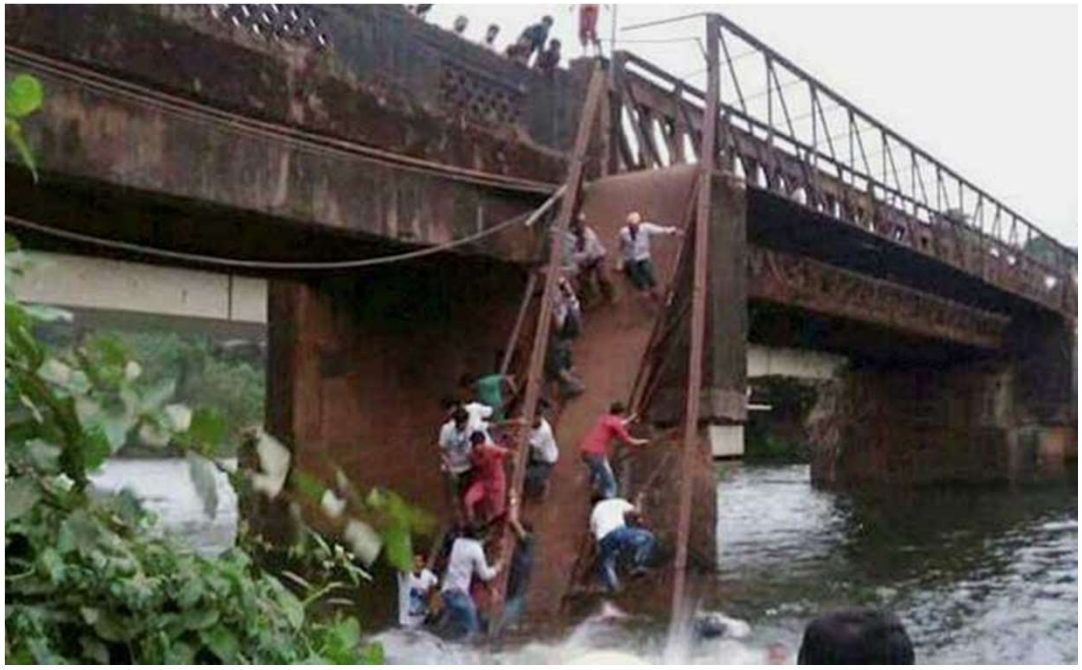
- Current regulations and guidance are too complex and unclear.
- Regulations and guidance must be simplified and unambiguous.
- Clarity of roles and responsibilities is poor.
- The means of assessing and ensuring the competency of key people throughout the system is inadequate.
- Compliance, enforcement and sanctions processes are too weak.
- The rules for ensuring high-rise and other complex buildings are built safe and remain safe should be more risk-based and proportionate.
- Primary responsibility for ensuring that buildings are fit for purpose must rest with those who commission, design and build the project.

Bridge collapses 2017

A14 Highway Italy – March 2017

Big Sur California March 2017

2 Dead, Several Missing As Bridge Collapses In Goa, Navy Called In For Rescue Ops – 19 May 2017



How did a $12 million bridge collapse in Kenya? – July 2017

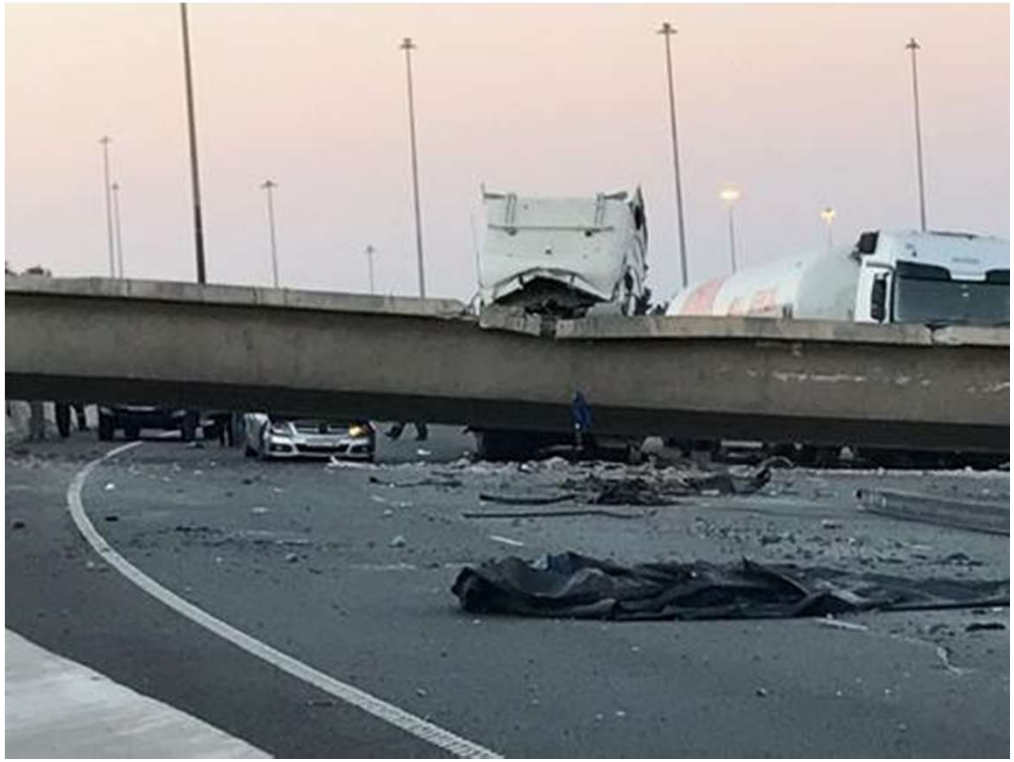
Singapore Highway Viaduct – July 2017

Failure during concrete pumping

Pedestrian bridge collapses on Highway 4, one dead – Israel 14 August 2017

Bolton railway station bridge collapse: Reopening date announced – August 2017

5 hurt in N3 pedestrian bridge collapse South Africa - August 2017



Mumbai station stampede kills at least 22 amid rumour bridge was collapsing – September 2017

10 Years After Bridge Collapse, America Is Still Crumbling – August 2017

In August 2007 the Interstate 35W bridge over the Mississippi River collapsed.

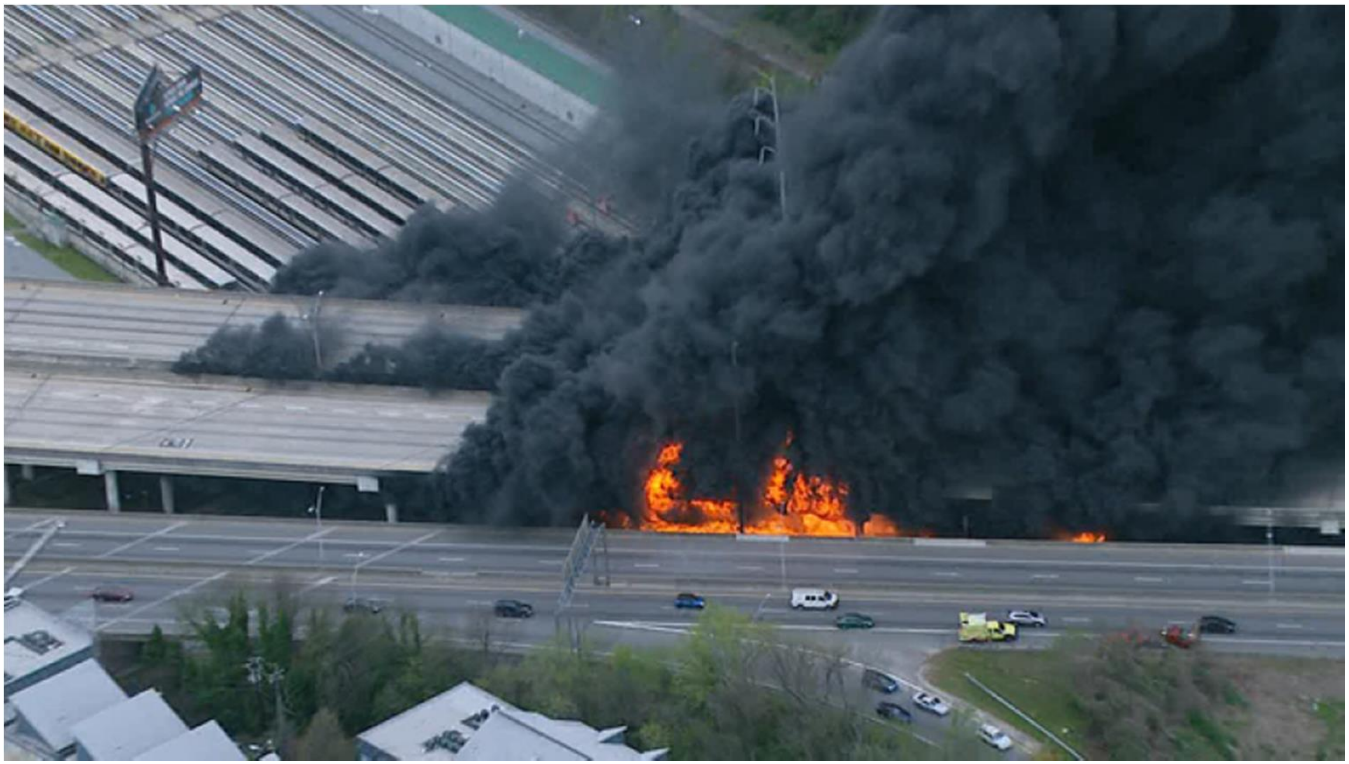
Thirteen people were killed, 145 more were injured, many of them seriously.

1 Dead, At Least 57 Injured After Bridge Collapses In Kerala's Chavara – 30 October 2017

The lone bridge linking Uttarkashi to the China border collapsed today, disconnecting dozens of villages – December 14 2017

Prague bridge collapse leaves 4 injured – 2 December 2017

Part of I-85 collapses in Atlanta after massive fire - 30 March 2017



MI bridge fire - 2011

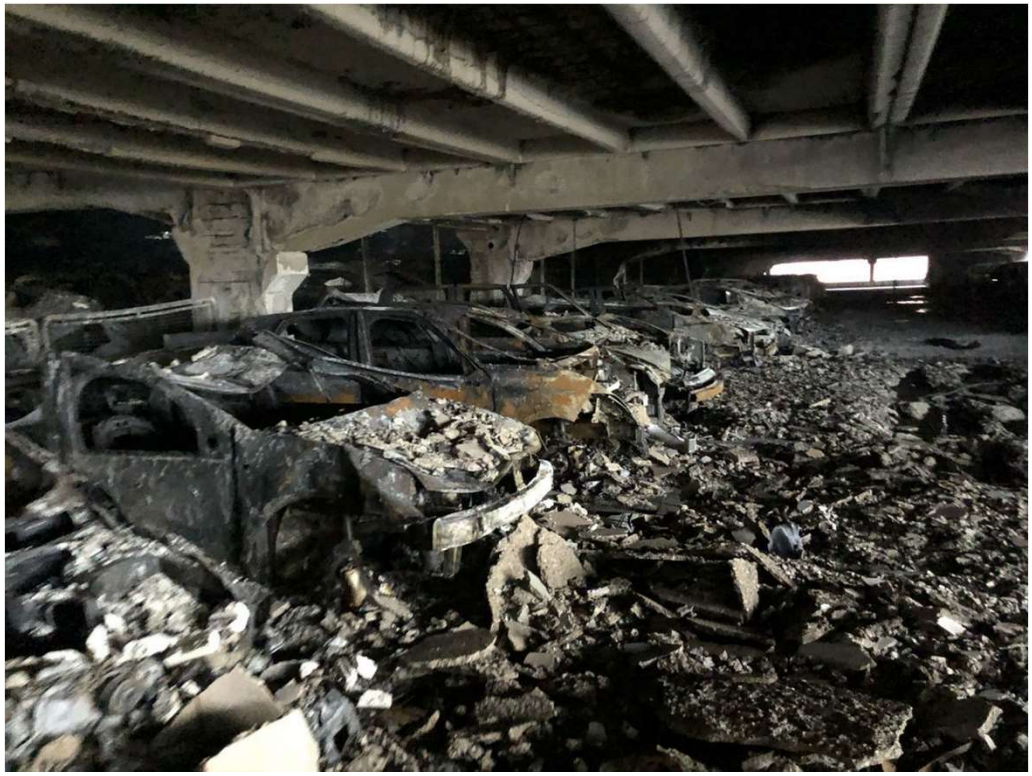

iPad
16:41
38%
Car park
Wapping Dock
Freijwheel Wheel
Of Liverpool
ACC Liverpool
2D
Google
Google
53°23'50"N 2°59'46"W 1,464 ft

Liverpool Arena Car Park December 2017

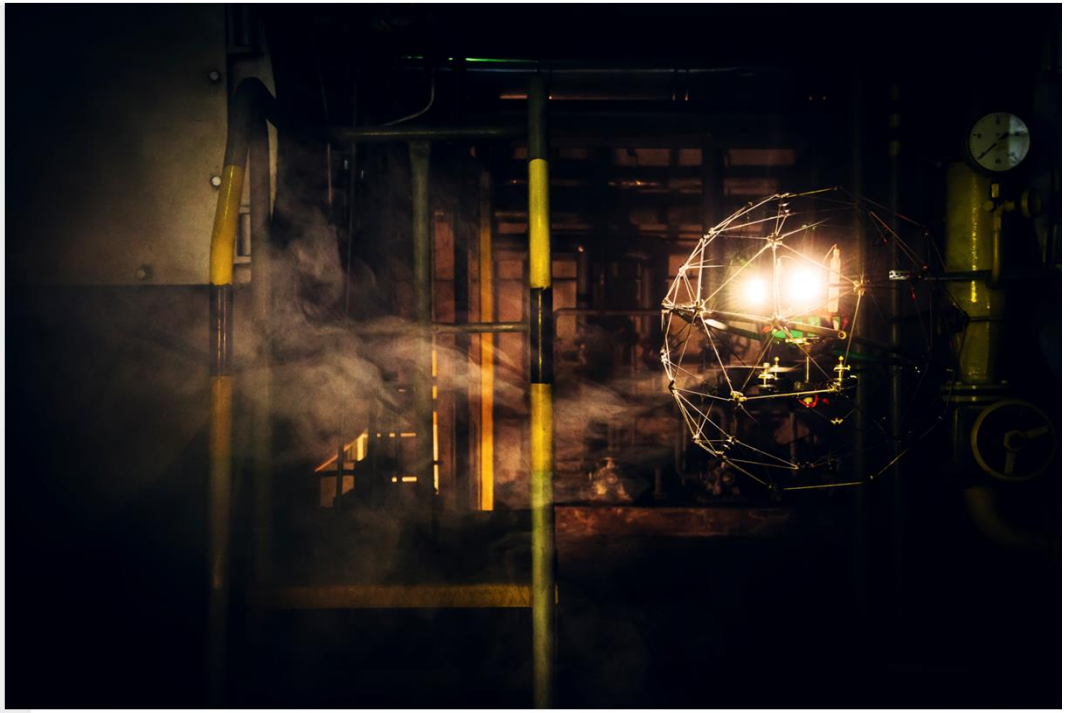
liquid fuel fire

1,400 cars destroyed

Destroyed



Elios collision tolerant drone

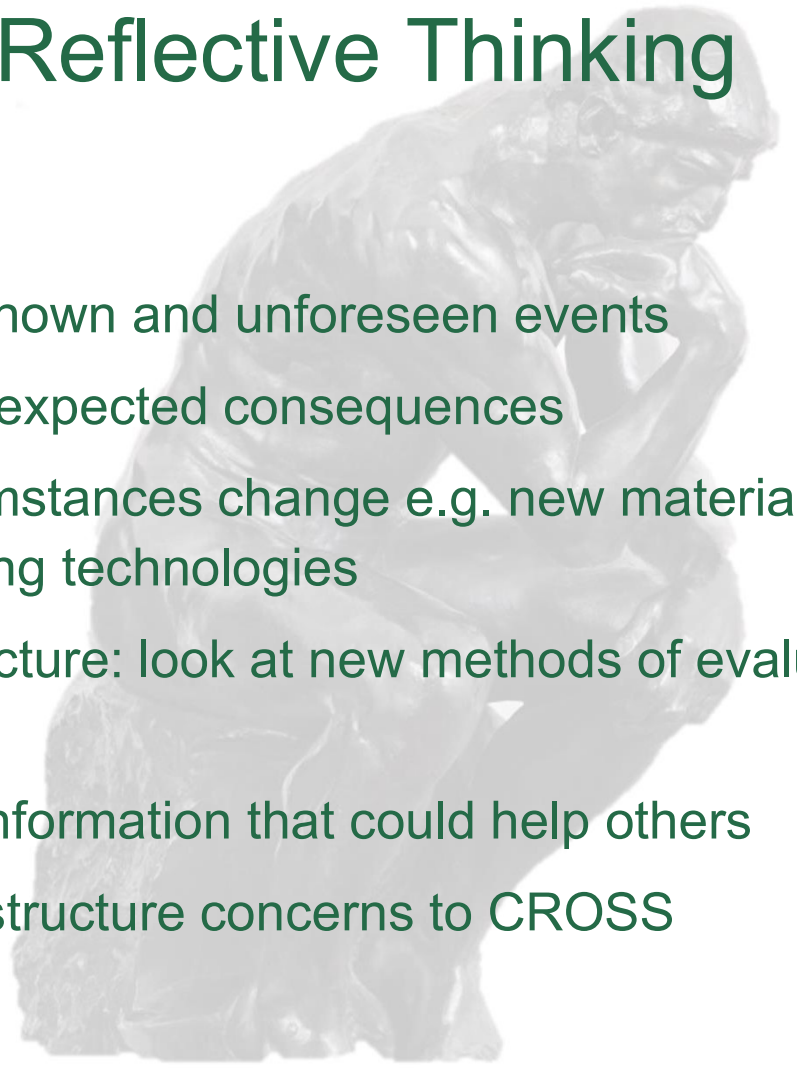



iPad
16:41
38%
Car park
Wapping Dock
Freijwheel Wheel
Of Liverpool
ACC Liverpool
2D
Google
Google
53°23'50"N 2°59'46"W 1,464 ft

Proposed data bases

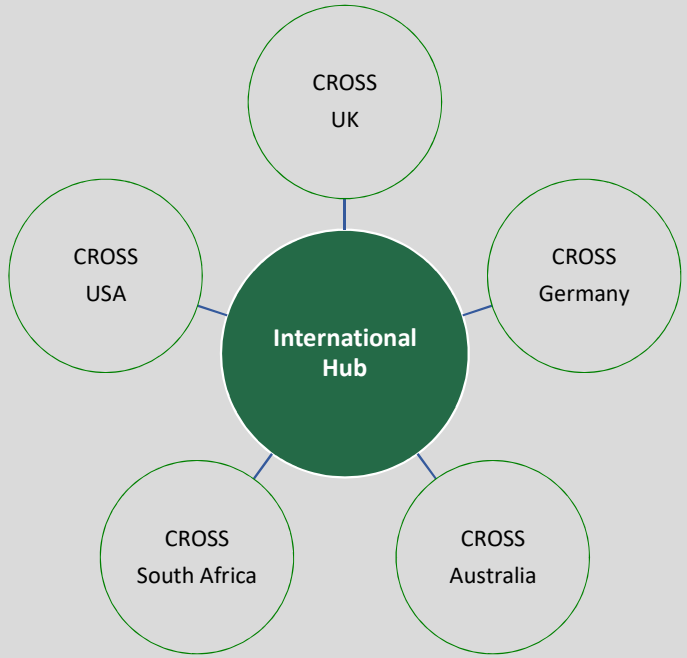
- IABSE task group on Forensic Engineering – Bridge Failures
- ICE/Structural-Safety central repository of buildings' data
- ICE In Plain Sight scheme for a log of infrastructure information (using CROSS)
- HSE/Lloyds Register/Manchester University repository of safety-related events
- NIST/CROSS/ASCE/SEI International failure data base

Reflective Thinking

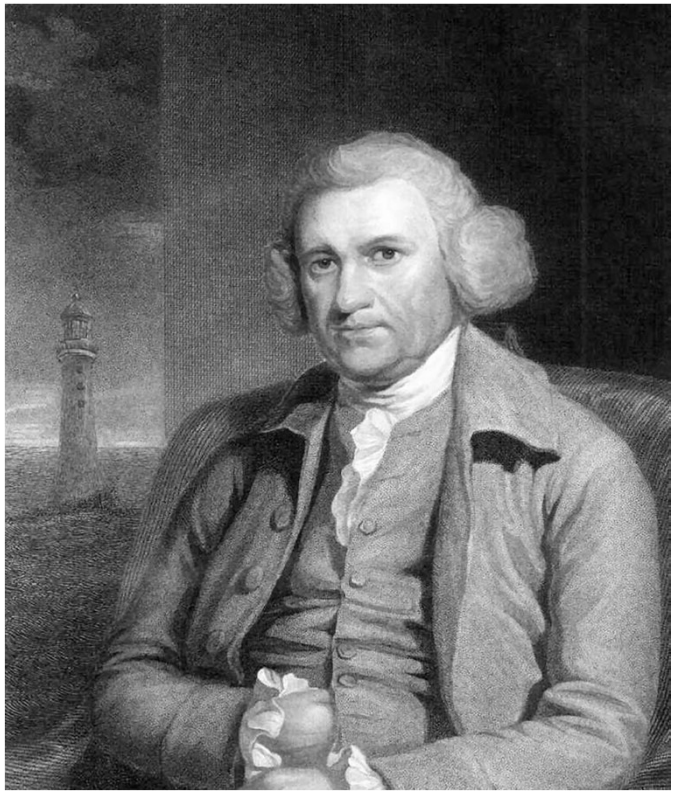


- Consider risks of both known and unforeseen events
- Consider the risks of unexpected consequences
- Review risk when circumstances change e.g. new materials, new forms of construction, emerging technologies
- Review ageing infrastructure: look at new methods of evaluation and repair
- Release safety-critical information that could help others
- Report bridge and infrastructure concerns to CROSS

CROSS International

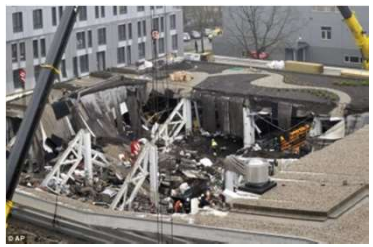


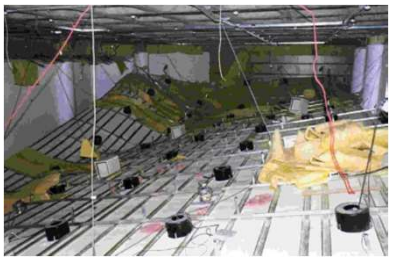
John Smeaton, Civil Engineer (1724-92)



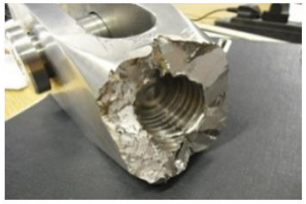
'Stone, wood and iron are wrought and put together by mechanical methods, but the greatest work is to keep right the animal part of the machinery.'

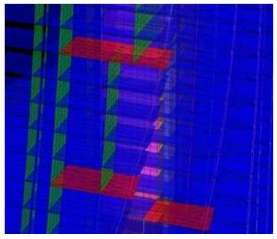
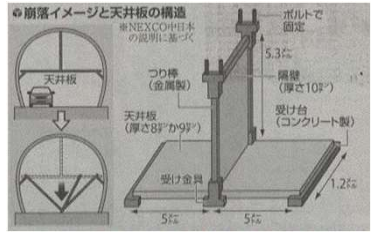
Brady Heywood







www.structural.safety.org