Bridge Owners Forum

Structural-Safety

Alastair Soane

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

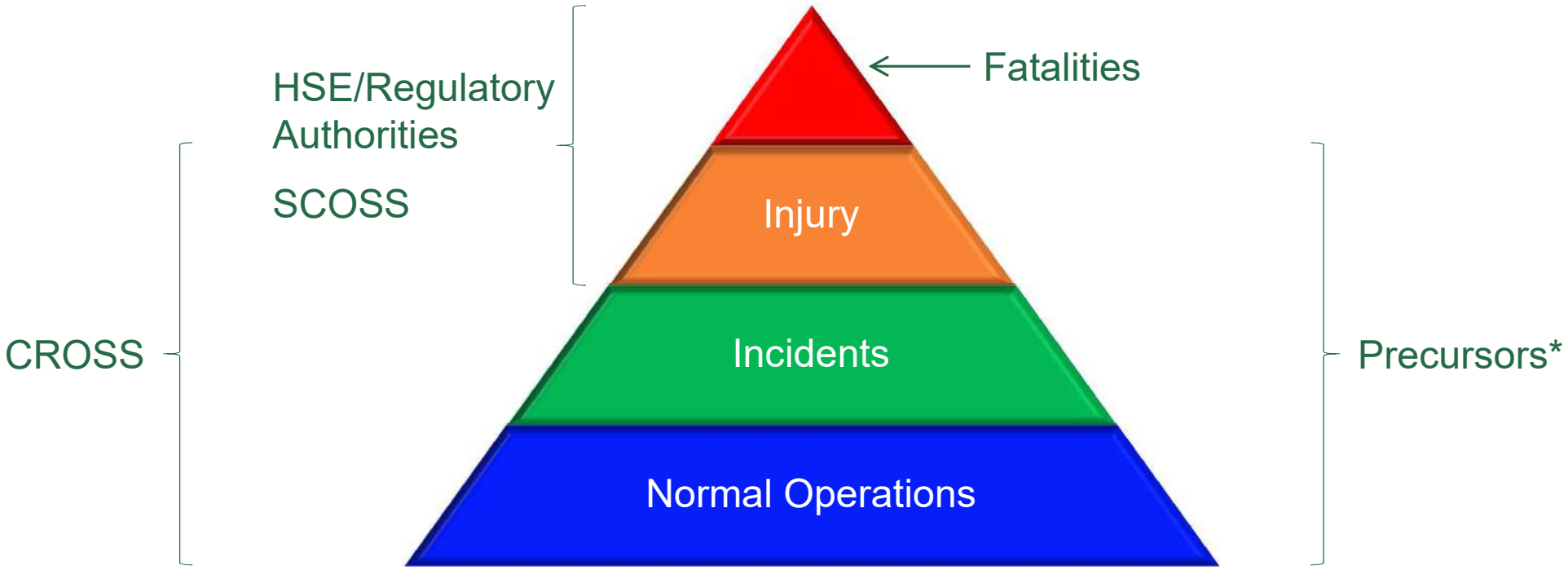
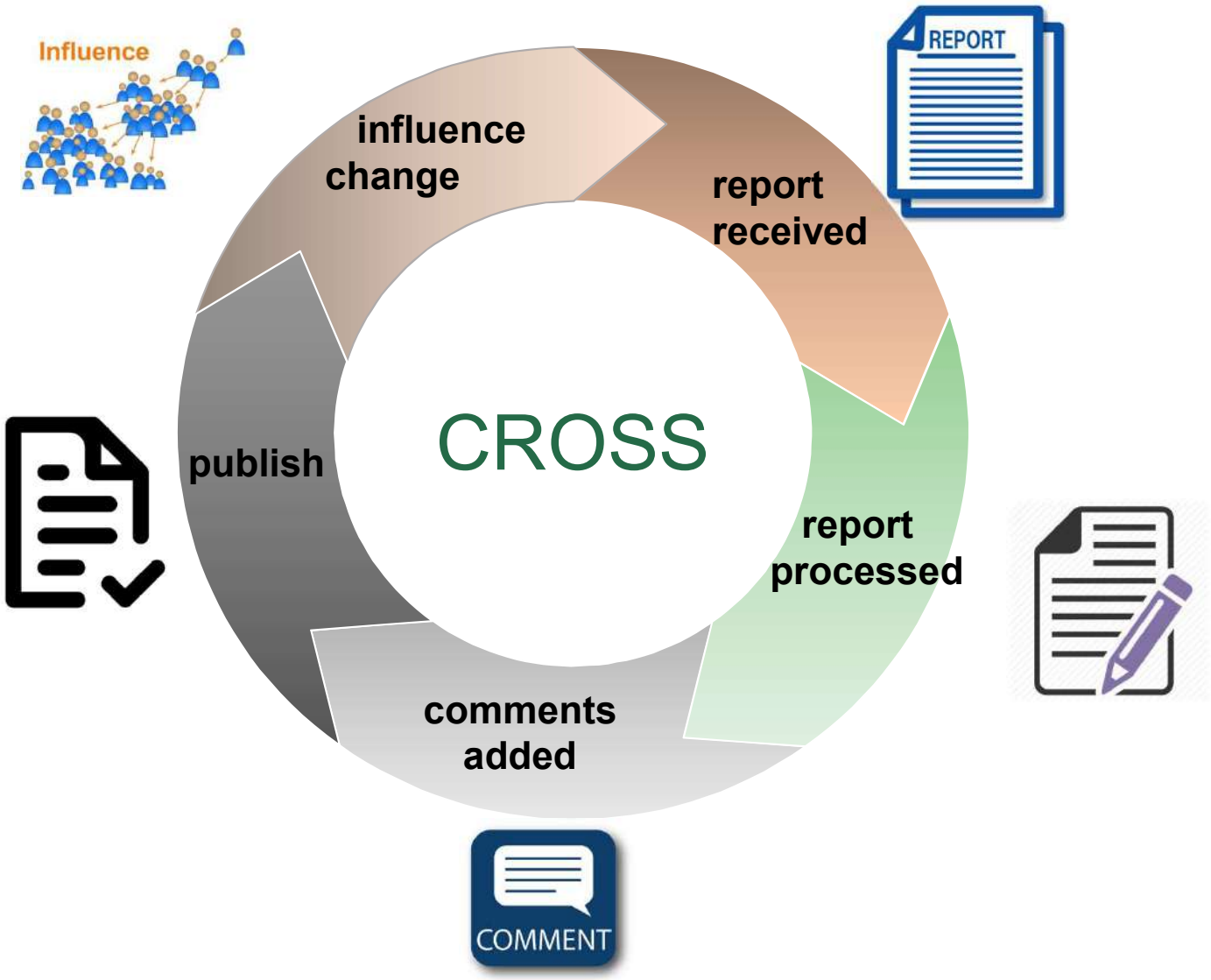
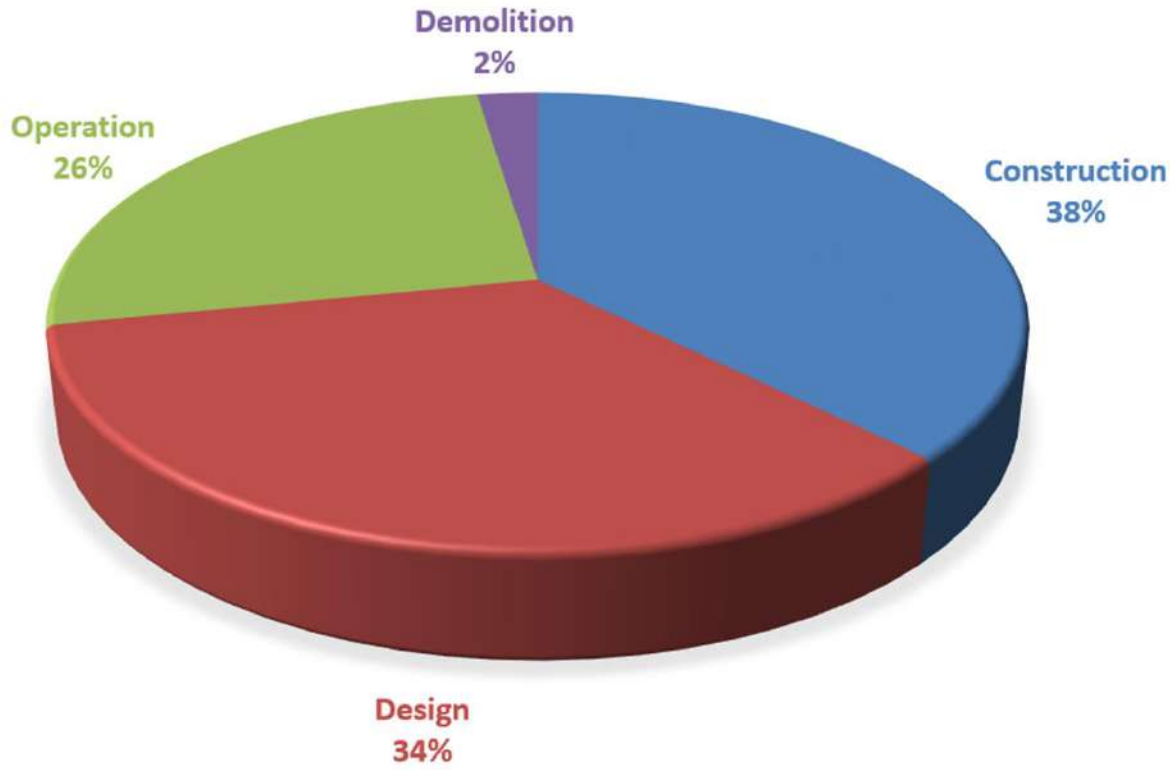


Diagram courtesy of ASRS

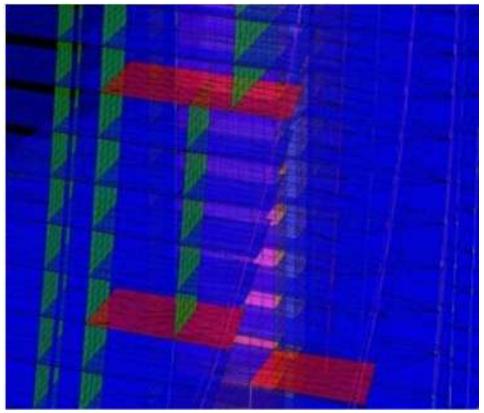
* Precursors should be reported internally and can be reported to CROSS


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

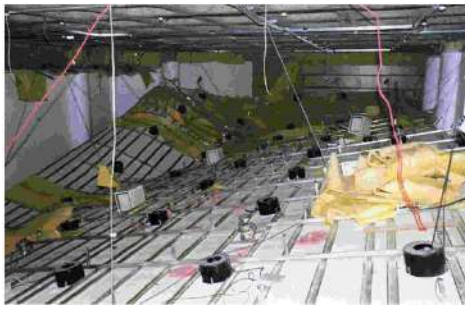
CROSS Reports - Concern About



From Temporary Works to Demolition

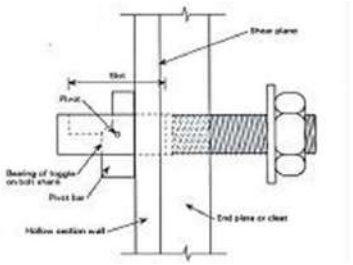


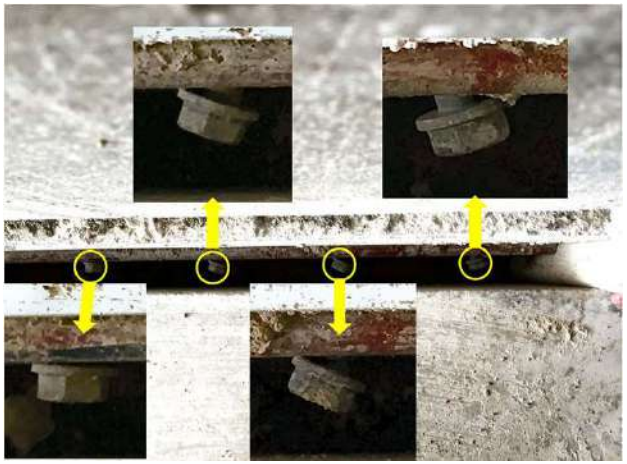
Fixing Failures



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

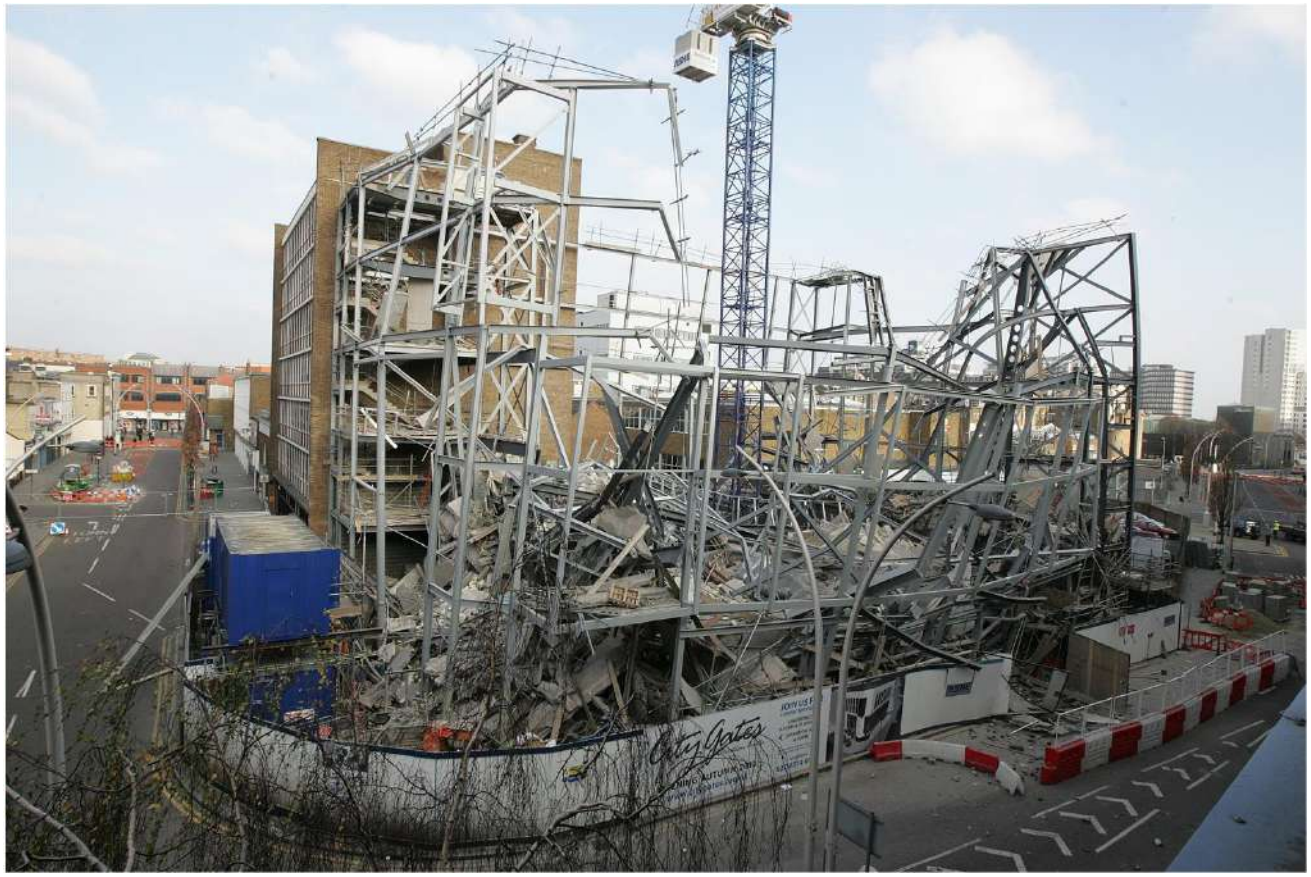
Indiana Stage Collapse - August 2011

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

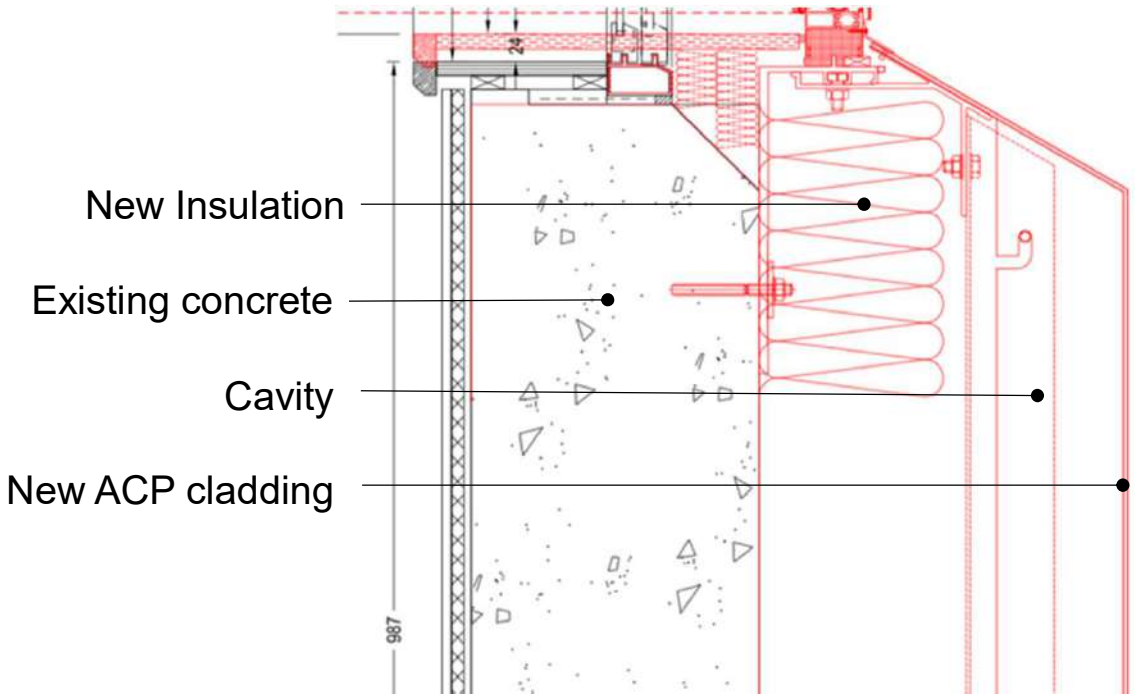
Cladding Fires

Lacrosse Tower
Melbourne 2014

Dubai hotel 2015

Precursors

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

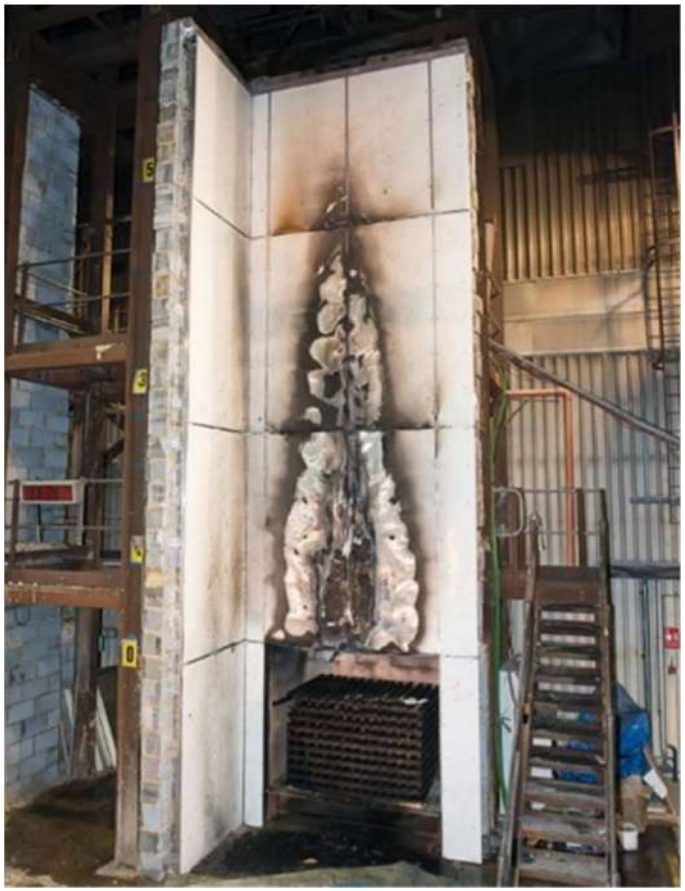


DCLG/BRE Fire Tests

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

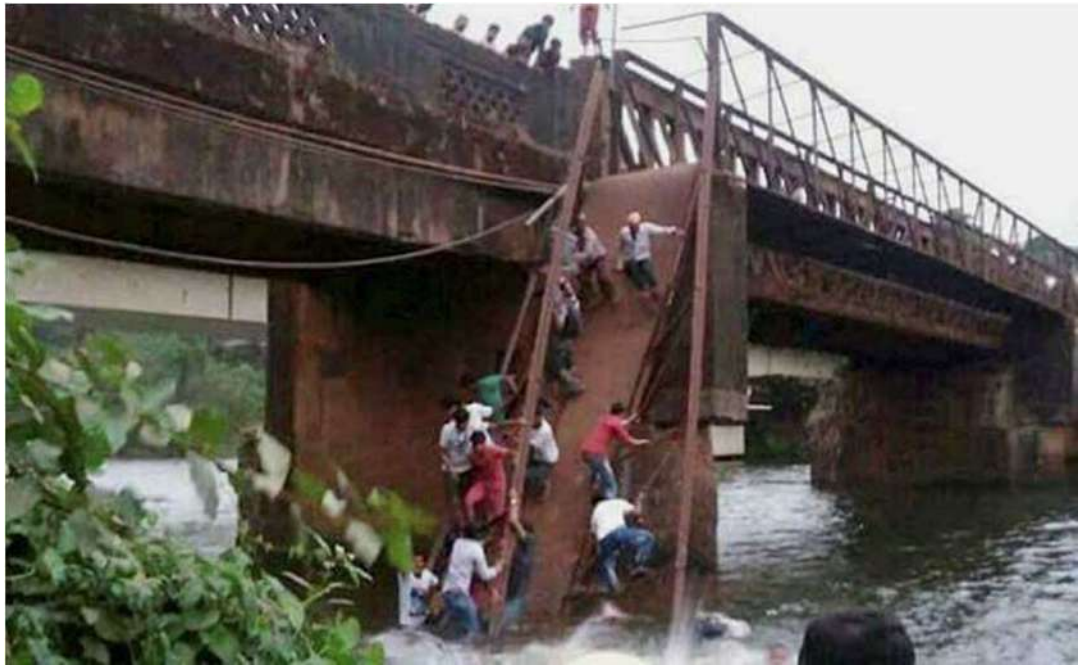
- Current regulations and guidance are too complex and unclear.
- Regulations and guidance must be simplified and unambiguous.
- Clarity of roles and responsibilities is poor.
- The means of assessing and ensuring the competency of key people throughout the system is inadequate.
- Compliance, enforcement 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.

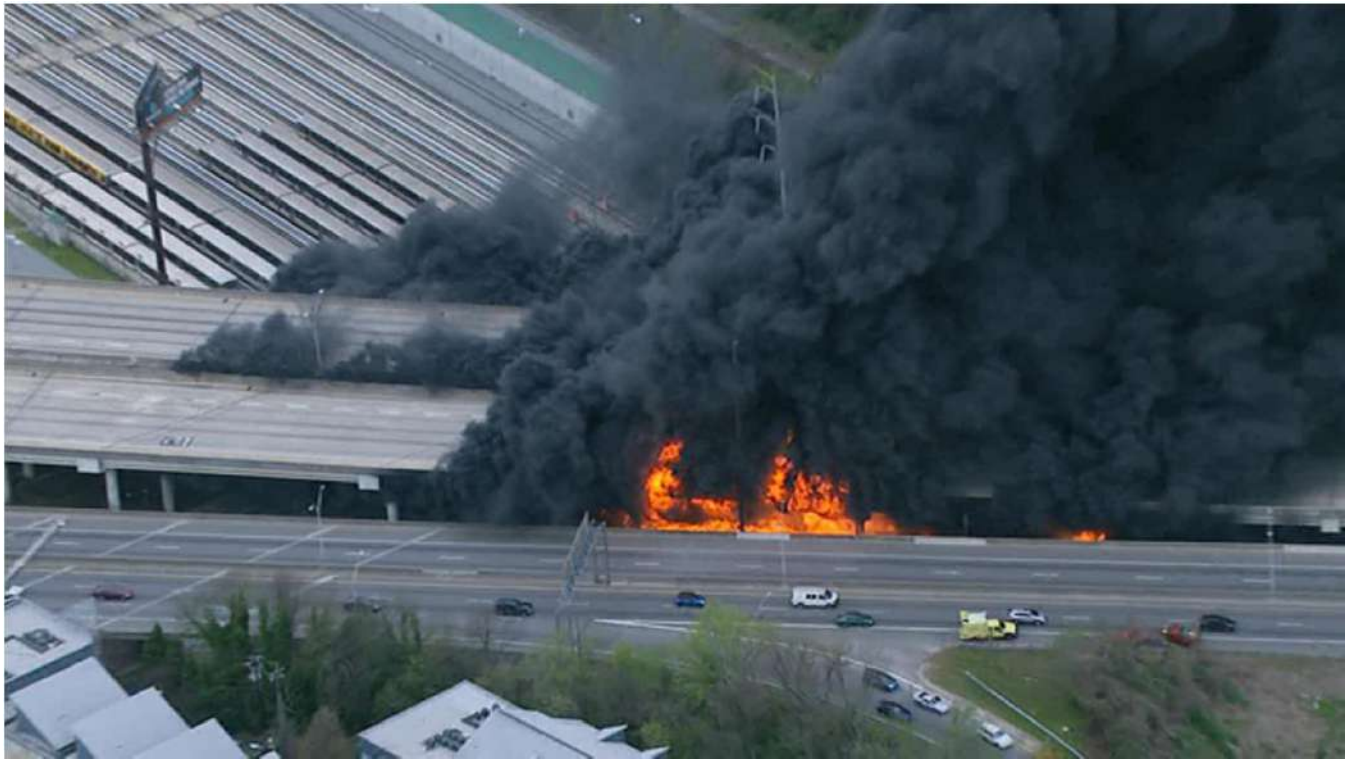
Thirteen people were killed, 145 more were injured, many of them seriously.

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

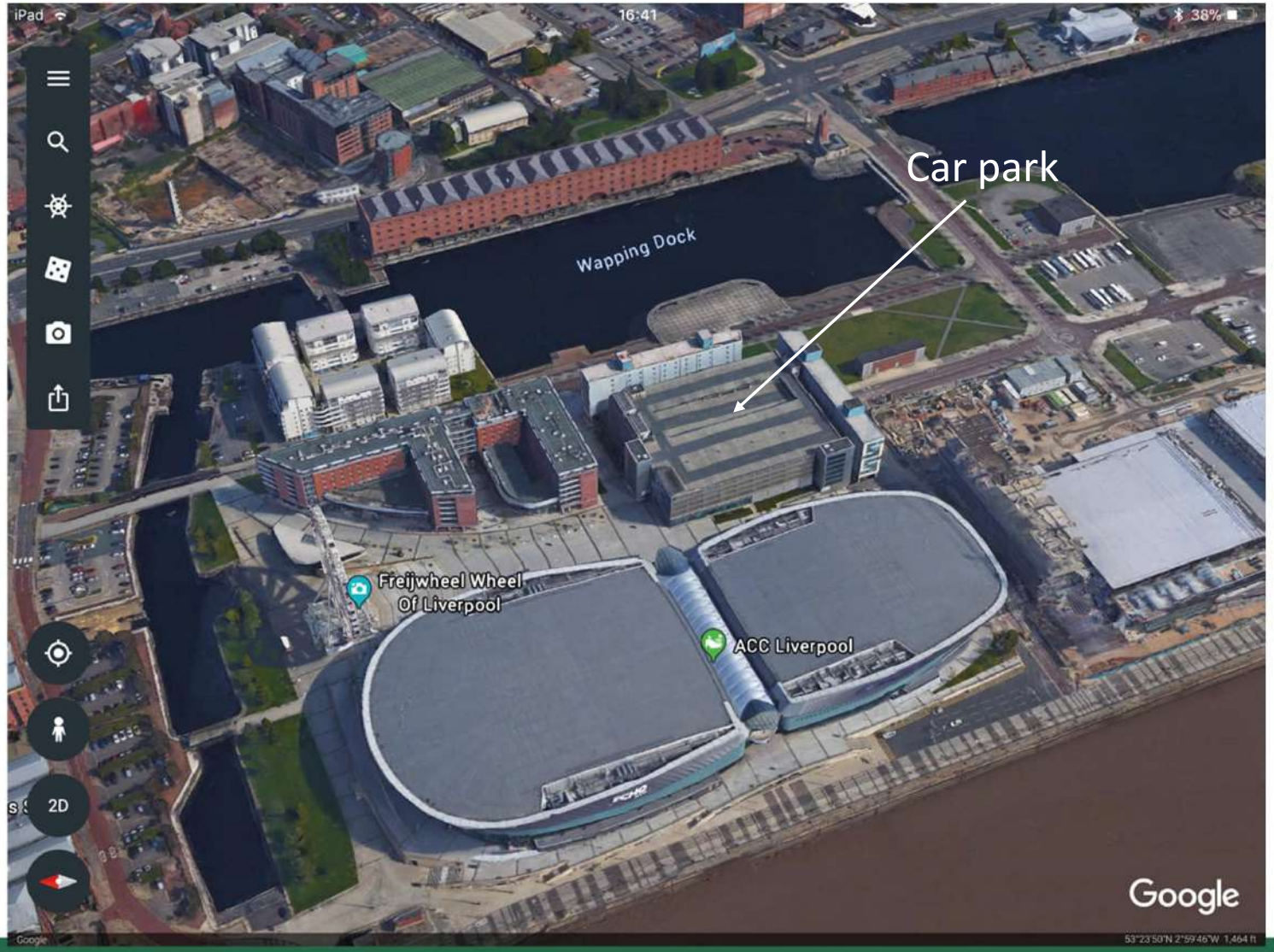
The lone bridge linking Uttarkashi to the China border collapsed today, disconnecting dozens of villages – December 14 2017

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

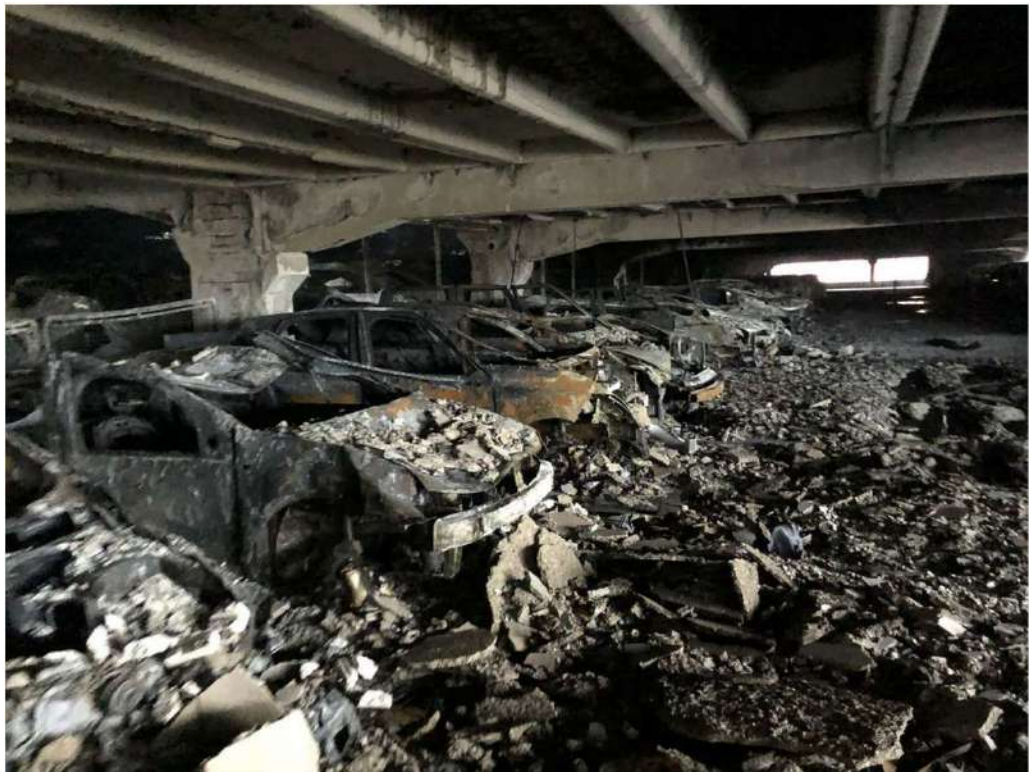

iPad
16:41
38%
Car park
Wapping Dock
Freijwheel Wheel
Of Liverpool
ACC Liverpool
2D
Google

Liverpool Arena Car Park December 2017

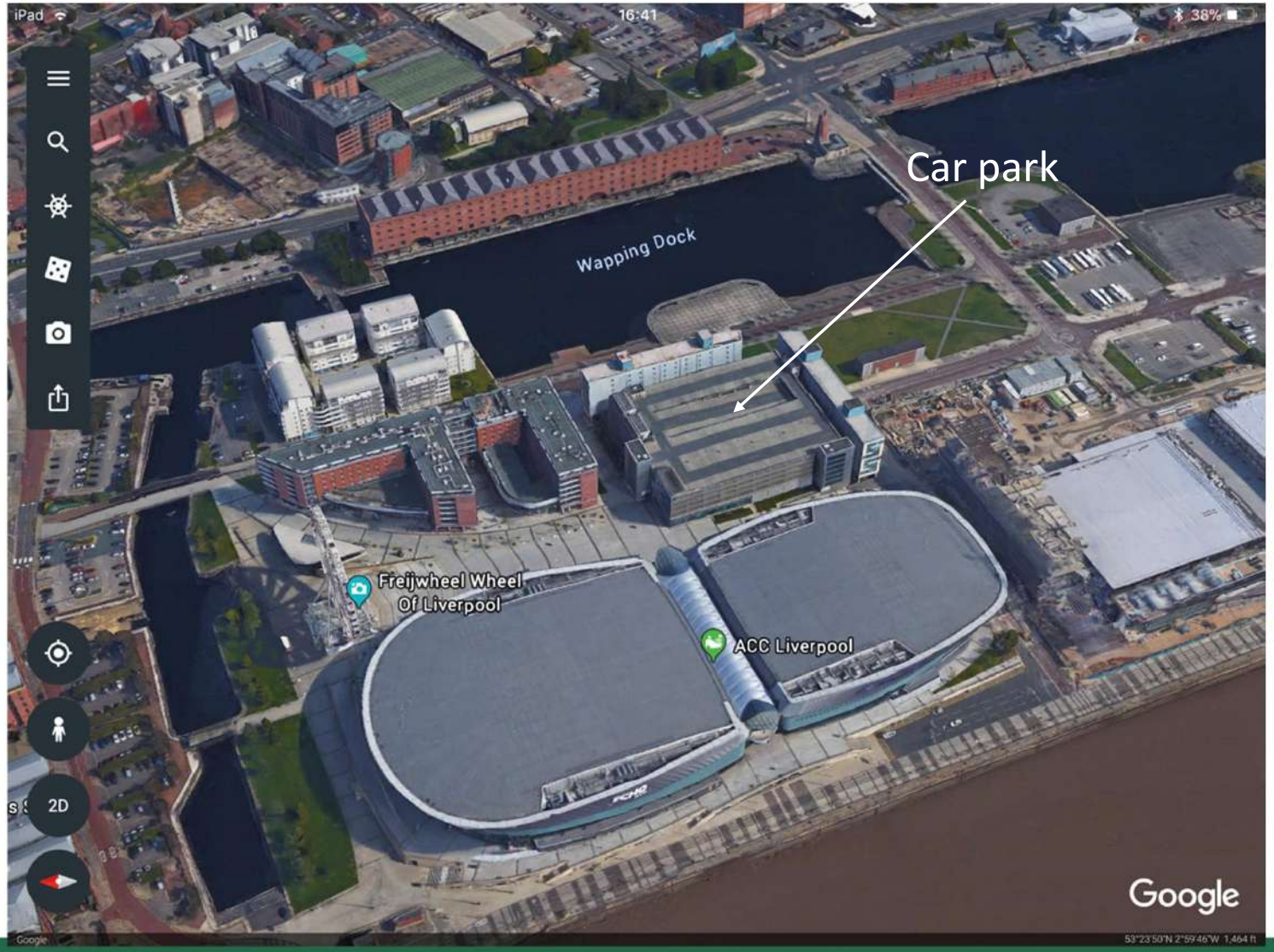
liquid fuel fire

1,400 cars destroyed

Destroyed



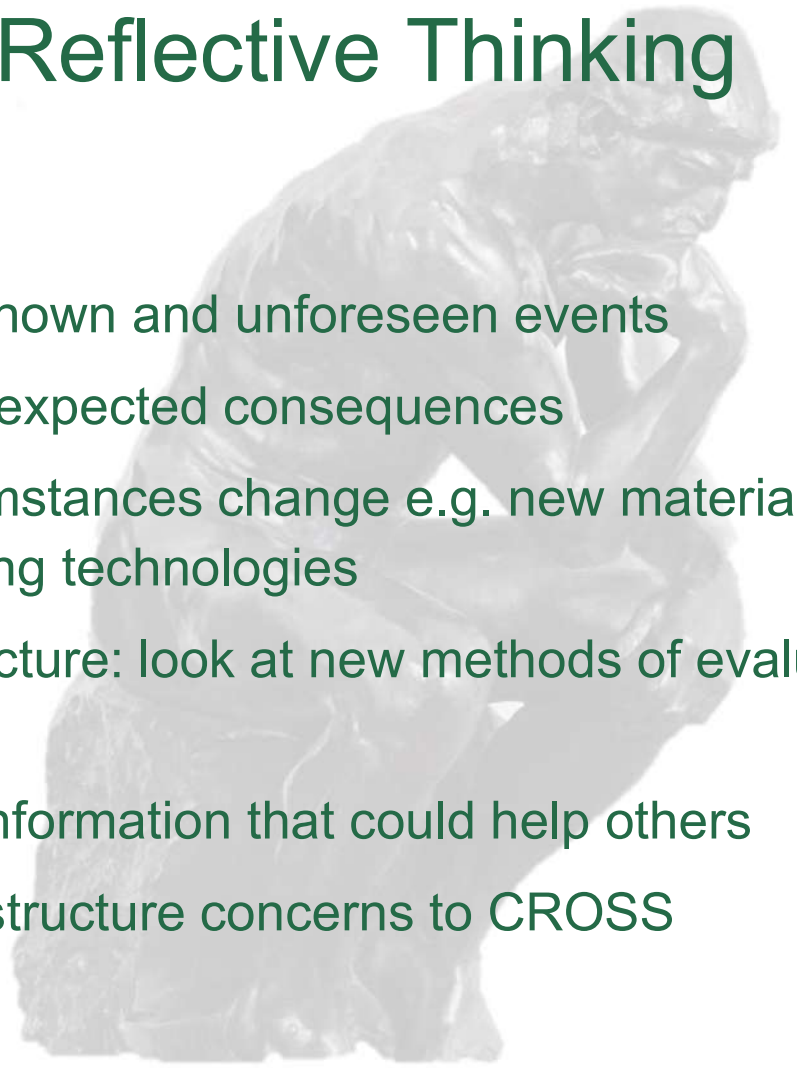
Elios collision tolerant drone


iPad
16:41
38%
Car park
Wapping Dock
Freijwheel Wheel
Of Liverpool
ACC Liverpool
2D
Google

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

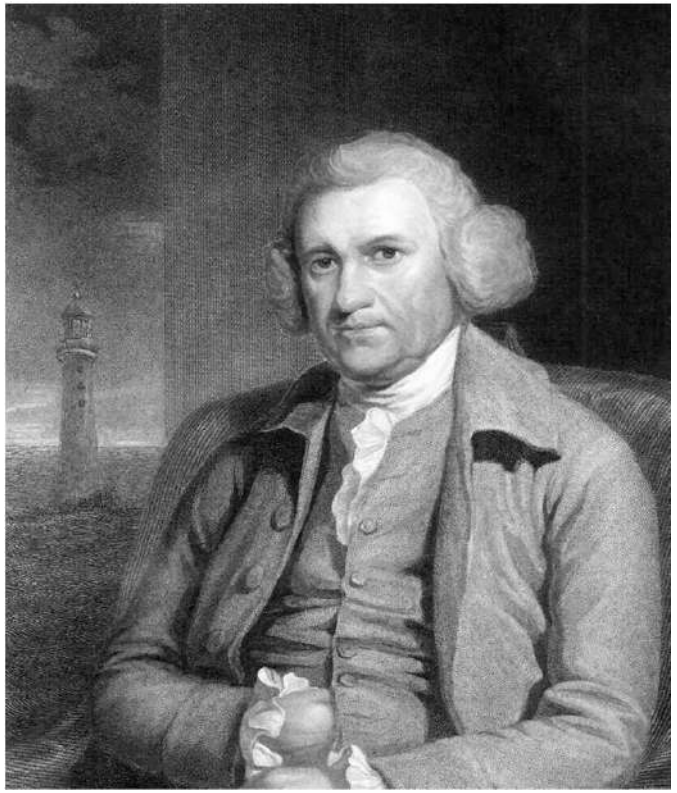
Reflective Thinking



- 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)

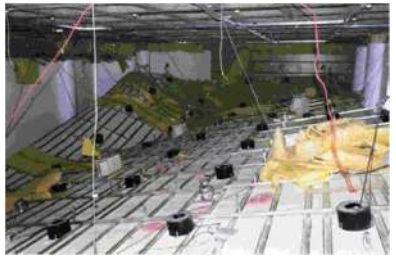


'Stone, wood and iron are wrought and put together by mechanical methods, but the greatest work is to keep right the animal part of the machinery.'

Brady Heywood

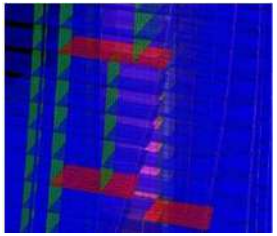
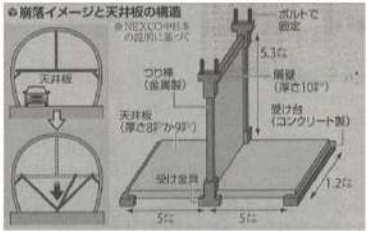














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