

CROSS

# Confidential Reporting on Structural Safety

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Director: Structural-Safety

January 2020



# Structural-Safety Group

*The Institution  
of Structural  
Engineers*



## SCOSS

Standing Committee on Structural Safety

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

## CROSS

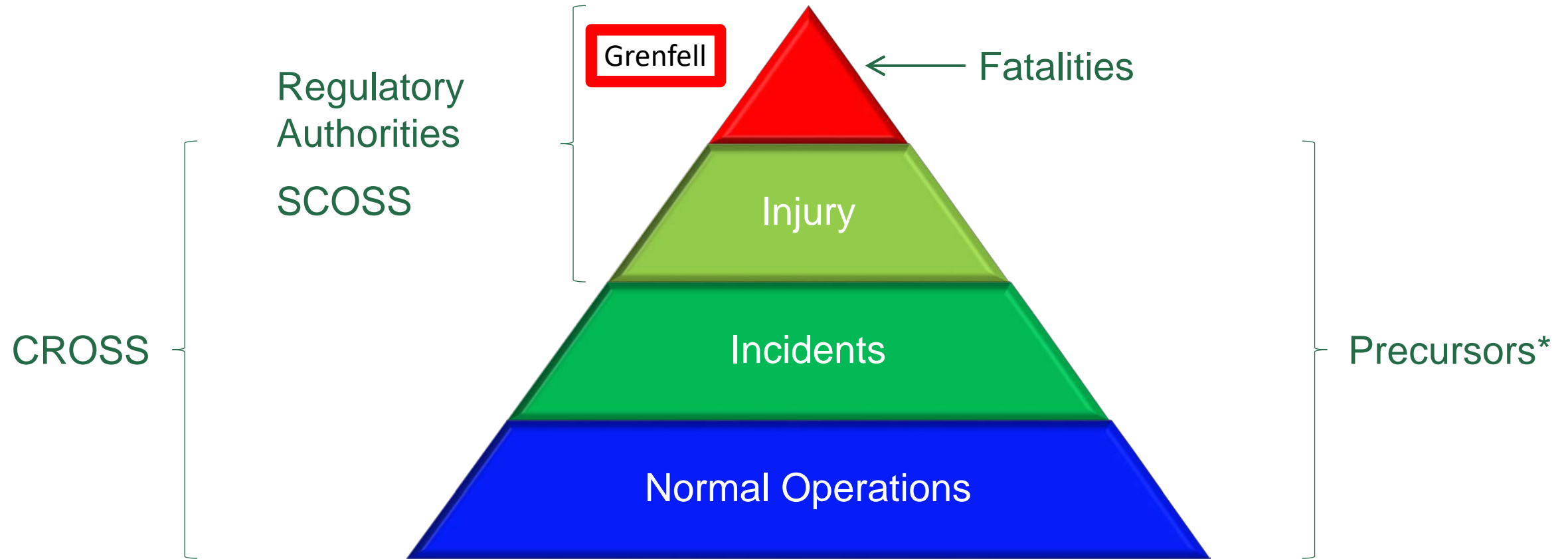
Confidential Reporting on Structural Safety

- Started 2005 (CROSS@15)
- Collects confidential data
- Provides comments on lessons to be learned
- Maintains report database
- Publishes Newsletters

**Voluntary Committee and Panel Members**



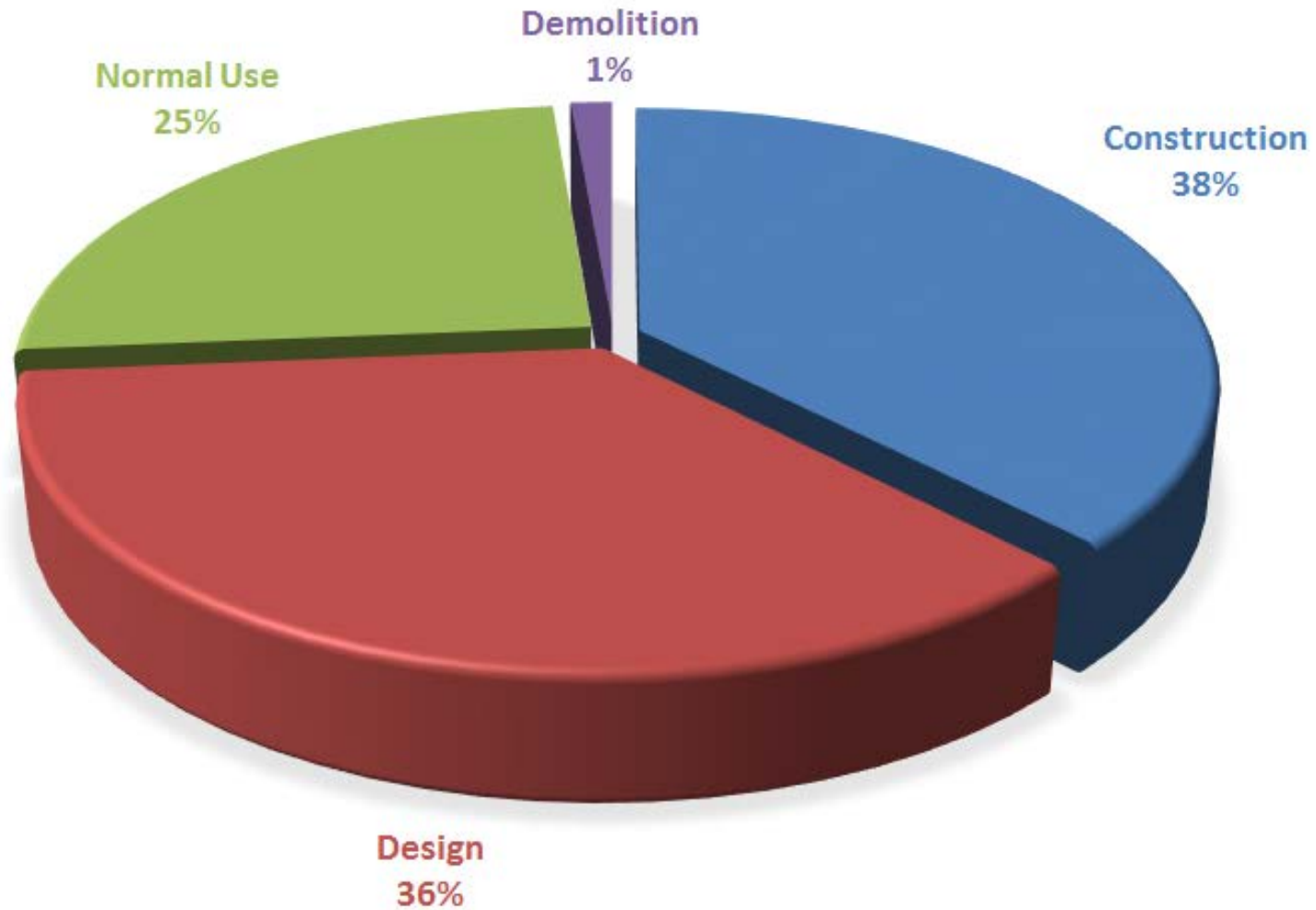
# Pyramid of Risk



*Diagram courtesy of ASRS*

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

# Reported Concerns or Events



Reporting  
page

Search data  
base

Register

**Structural-Safety**  
Incorporating CROSS and SCOSS

The Institution of Structural Engineers | ice | HSE

Home | About Us | Confidential Reporting | Search Database | Publications | International

**Quick Search**  
Keyword(s):   
Classification:   
None Selected -

**Recent Reports**

858 Repeating the same mistakes  
A correspondent who investigates engineering failures has submitted a CROSS report to share common errors which engineers keep repeating.  
[View Report](#)

857 Rotting of cross-laminated timber (CLT) roof panels  
The reporter was asked to check the roof of a building which had been leasing for a few years but was still occupied.  
[View Report](#)

**Current matters under consideration**

- Quality of construction
- Fire in buildings
- Supervision and inspection on site
- Robustness
- Weather damage to buildings

[Reports](#) on these subjects are sought, as well as on any other safety issues.

**Latest Newsletter**  
Newsletter 56 - October 2019  
[View All Newsletters](#)

**Recent Publications**

December 2019 [SCOSS Alert: Structural Safety of Glass in Balustrades](#)  
October 2019 [CROSS Newsletter 56](#)  
May 2019 [Structural-Safety Group Review 2017-18](#)  
May 2019 [SCOSS Alert: Failure of RAAC Planks](#)

**CROSS (Confidential Reporting on Structural Safety)**  
CROSS depends on individuals and firms participating by sending reports of their experiences and concerns on structural safety in confidence to CROSS.  
Reports submitted to CROSS are completely confidential and neither personal details nor information that could be used to identify a project or product are seen by anyone other than the Designated Persons as detailed on our [People](#) page.  
Visit our [Confidential Reporting](#) page to find out more about our scheme or if you have an experience that could be useful to others, please contribute by submitting a report.

**SUBMIT CROSS REPORT**

**MORE REPORTS ARE ALWAYS NEEDED**

**Recent Publications from CROSS International Partners**  
Recent publications from CROSS International partners include:  
July 2019 [CROSS-AUS Newsletter 2](#)  
May 2019 [CROSS-AUS Update](#)

**Weather Damage Reports**  
Severe weather events have caused extensive damage and disruption to infrastructure and buildings with serious consequences for many.  
Creating a record of damage to buildings and structures has the support of MHCLG (Ministry of Housing, Communities and Local Government) and other government agencies in the UK to help formulate long term strategies for the Building Regulations.  
The CROSS system will be used for collecting and processing information on weather damage. Visit our [What To Report](#) page for more information or [submit a report](#) on weather damage.

**Email Updates**  
Enter your name and email address below to sign-up for email updates from Structural-Safety. Your personal data will only be used for this purpose and you can unsubscribe at any time. Please see our [Privacy Policy](#) for further information.  
Name:   
Email:

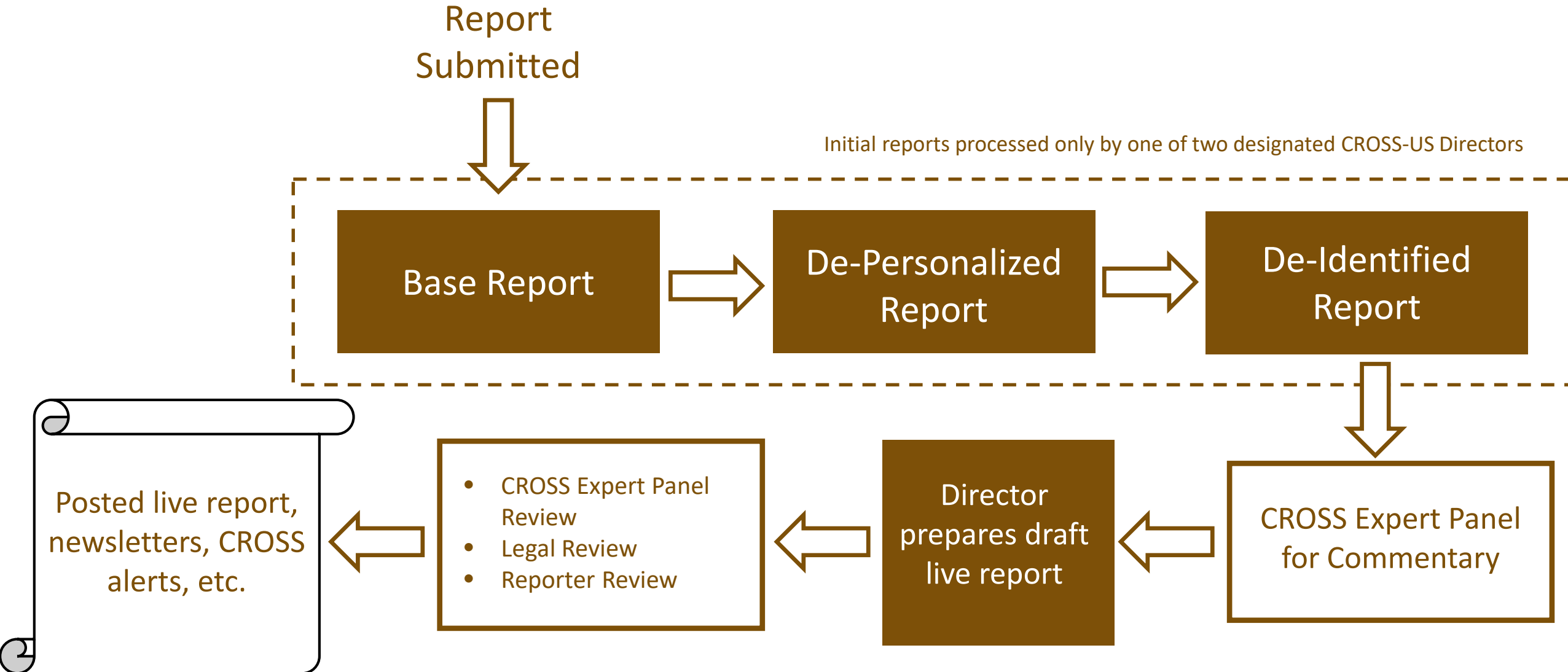
**How to Report**  
Online submission:  
  
Submit by post:

**Feedback**  
Submit comments and questions regarding Structural Safety and this website.

Structural-Safety UK  
E: [structures@structural-safety.org](mailto:structures@structural-safety.org)  
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[www.structural-safety.org](http://www.structural-safety.org)

# Processing Reports





# Alert: Failure of RAAC Planks - May 2019

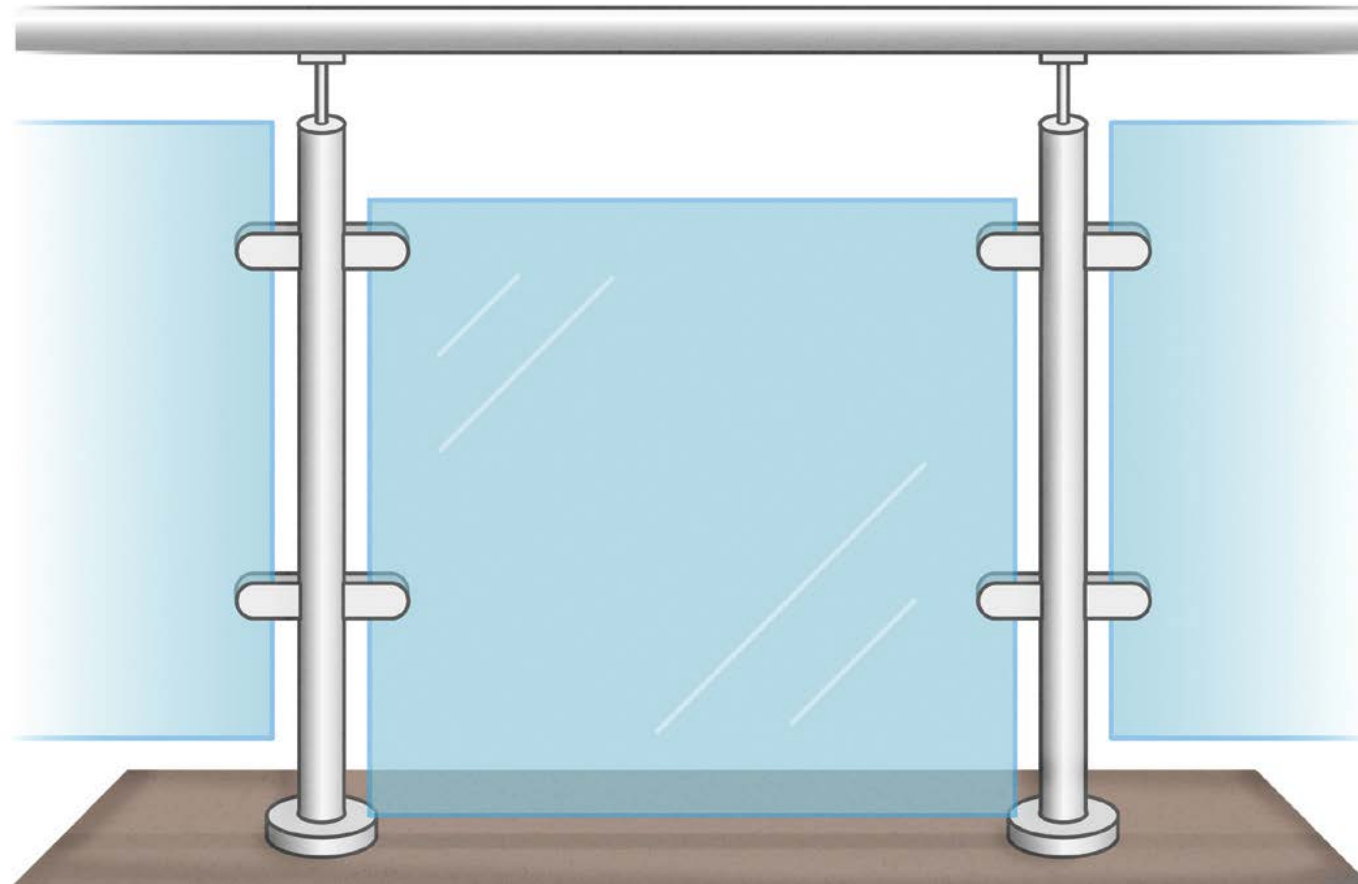


# Schools, hospitals and similar buildings from 1960s -80s

- Rusting of embedded reinforcement leading to cracking and spalling of the cover
- Cracking, of varying degrees of severity, thought to be associated with moisture and temperature related movements in the planks
- Excessive deflections due to creep
- Floor and roof planks tending to act independently, rather than as a single structural entity.



# Alert: Structural Safety of Glass in Balustrades - December 2019



# Fixings

- Reliance on clamping of glass, with no through fixings to provide positive retention.
- Failure to properly tighten the clamp fixings, or loosening of fixings by vibration, or post-installation relaxation of the rubber/plastic pads
- Misalignment of fixings may generate bending stresses in the glass.
- Omission or under-tightening of fixings.

# Liverpool Echo Arena Car Park Fire - December 2017



Hydro-carbon fire

1,150 cars destroyed





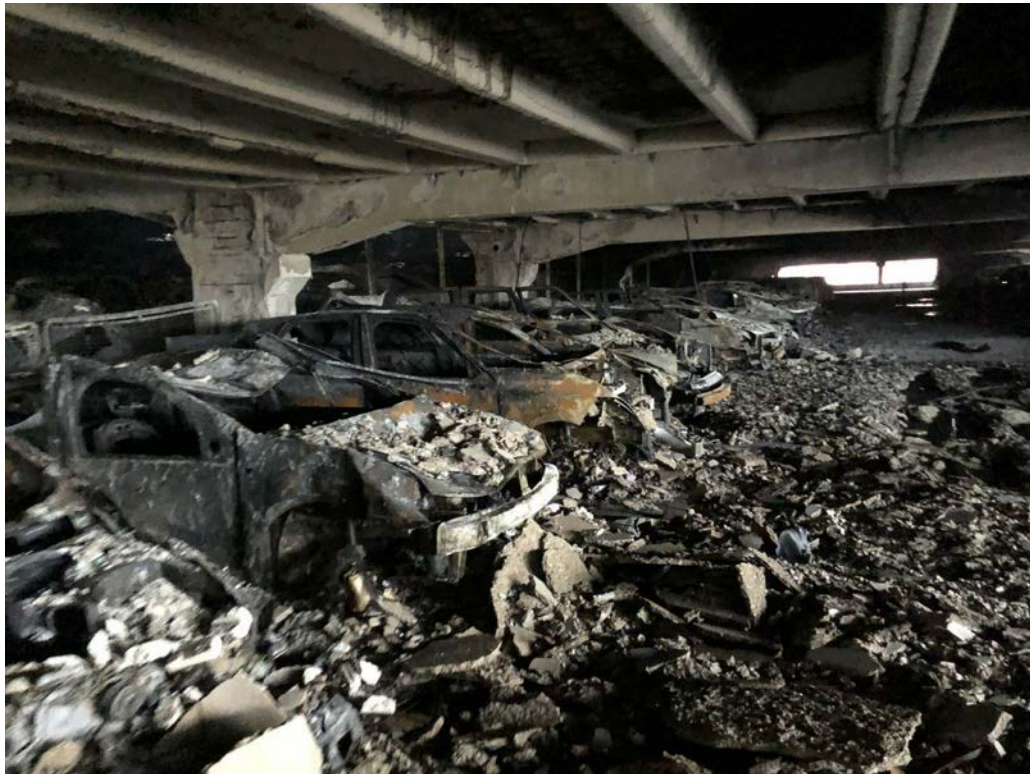
# Demolition 12 months later





# Parallels

Liverpool UK January 2018



Cork Ireland September 2019



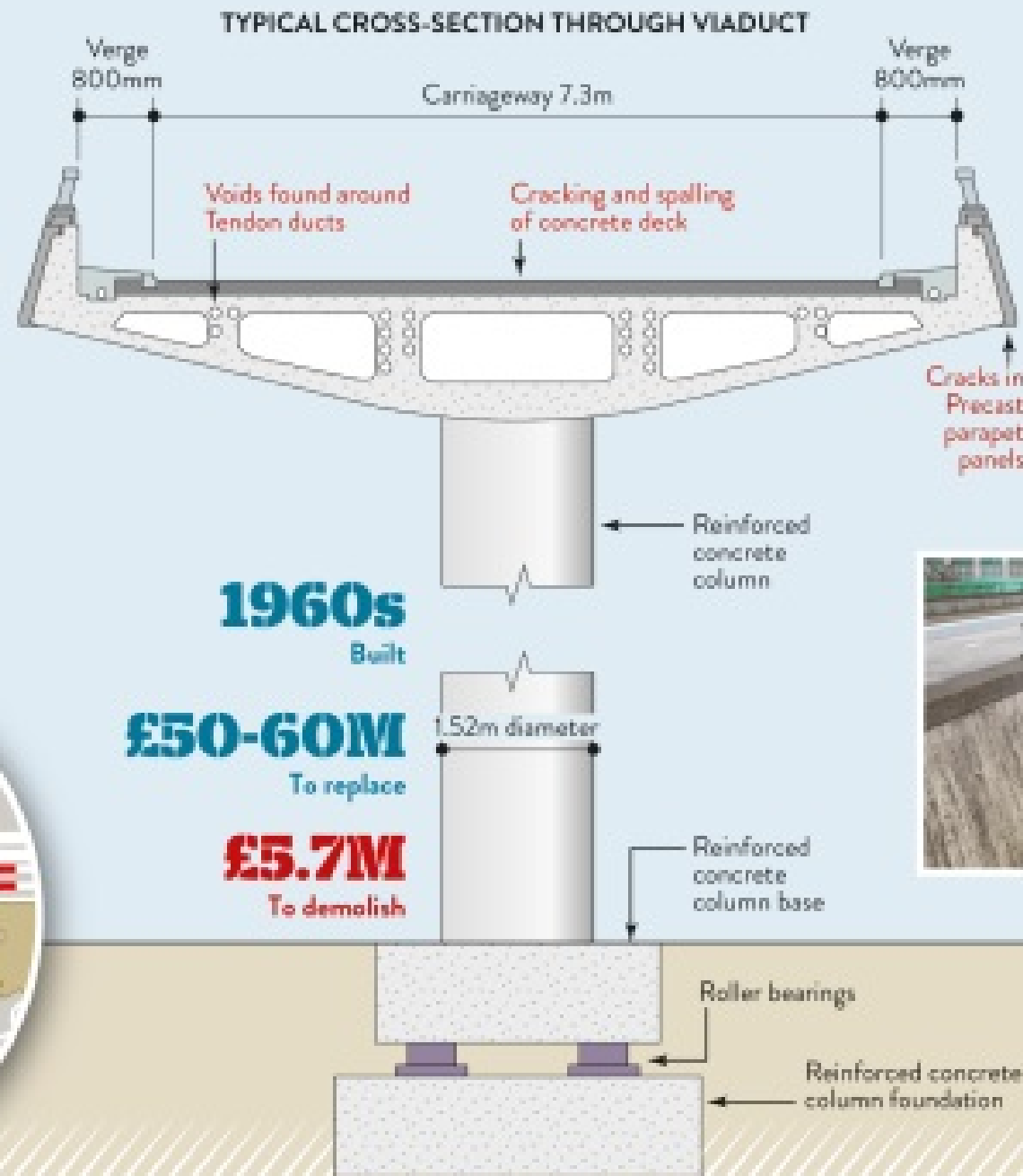
Attribution to Cork Fire Brigade on Twitter



# Churchill flyover Liverpool



# CONDEMNED: CHURCHILL WAY FLYOVERS - LIVERPOOL



Green netting on parapets protects cars from falling material



# Demolition









# Edge panel fixings





# The equipment and the result



# Reducing the Risk of Infrastructure

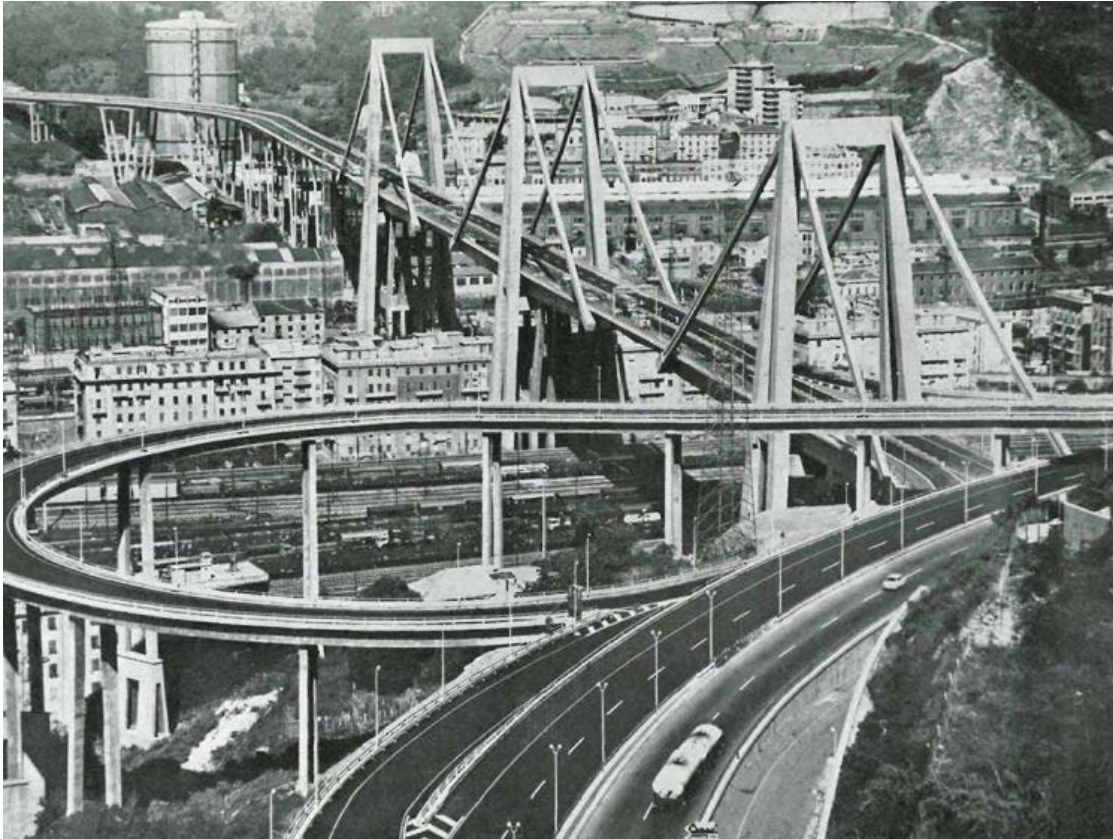
- Risk of a major failure of UK infrastructure is not low enough.
- Recommendation: Build on the work of CROSS

Whaley Bridge  
Dam UK  
August 2019





# Grim reminder – Polcevera viaduct

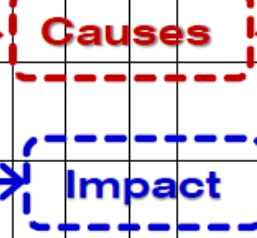


# Russian data base on bridge collapses

TG-1.5 "Bridge Collapse : Cases & Causes"



| Cases of Failure |               |               |            | Bridge     |     |         |   |                        |               |                |                      |               |             |            |               |               |              |                     |                |           |
|------------------|---------------|---------------|------------|------------|-----|---------|---|------------------------|---------------|----------------|----------------------|---------------|-------------|------------|---------------|---------------|--------------|---------------------|----------------|-----------|
| Date of failure  | Bridge (name) | Country       | Function   | Life-Cycle |     |         |   | Bridge Characteristics |               |                |                      |               |             |            | Bridge Usage  |               |              | Environement        |                |           |
|                  |               |               |            | Constr.    |     | Failure |   | Total length (m)       | Main span (m) | "Headroom" (m) | Main superstructure  |               | Carriageway |            | Side walk (m) | On the bridge |              | Traffic below (v/d) | Salts, sea air | Pollution |
|                  |               |               |            | Start      | End | Year    | Stage                                     |                        |               |                | Material             | Type          | Width (m)   | Lanes (no) |               | Traffic (v/d) | People (p/d) |                     |                |           |
| 1                | 2             | 3             | 4          | 5          | 6   | 7       | 8   | 9                      | 10            | 11             | 12                   | 13            | 14          | 15         | 16            | 17            | 18           | 19                  | 20             | 21        |
| 1966-08-10       |               | Canada        | Highway    | 1965       |     | 1966    | Construction                              |                        |               |                | Reinforced concrete  | Arched bridge |             |            |               |               |              |                     |                |           |
| ??-??-1966       |               | Belgium       | Highway    |            |     | 1966    | Operation without interruption of traffic |                        |               |                |                      |               |             |            |               |               |              |                     |                |           |
| ??-??-1966       |               | Germany       | Highway    |            |     | 1966    | Construction                              |                        |               |                | Reinforced concrete  |               |             |            |               |               |              |                     |                |           |
| ??-??-1967       |               | Mexico        | Highway    |            |     | 1967    | Construction                              |                        |               |                | Reinforced concrete  |               |             |            |               |               |              |                     |                |           |
| ??-??-1967       |               | Great Britain | Highway    |            |     | 1967    | Construction                              |                        |               |                | Reinforced concrete  |               |             |            |               |               |              |                     |                |           |
| ??-??-1967       |               | Great Britain | Footbridge |            |     | 1967    | Operation without interruption of traffic |                        |               |                | Prestressed concrete |               |             |            |               |               |              |                     |                |           |



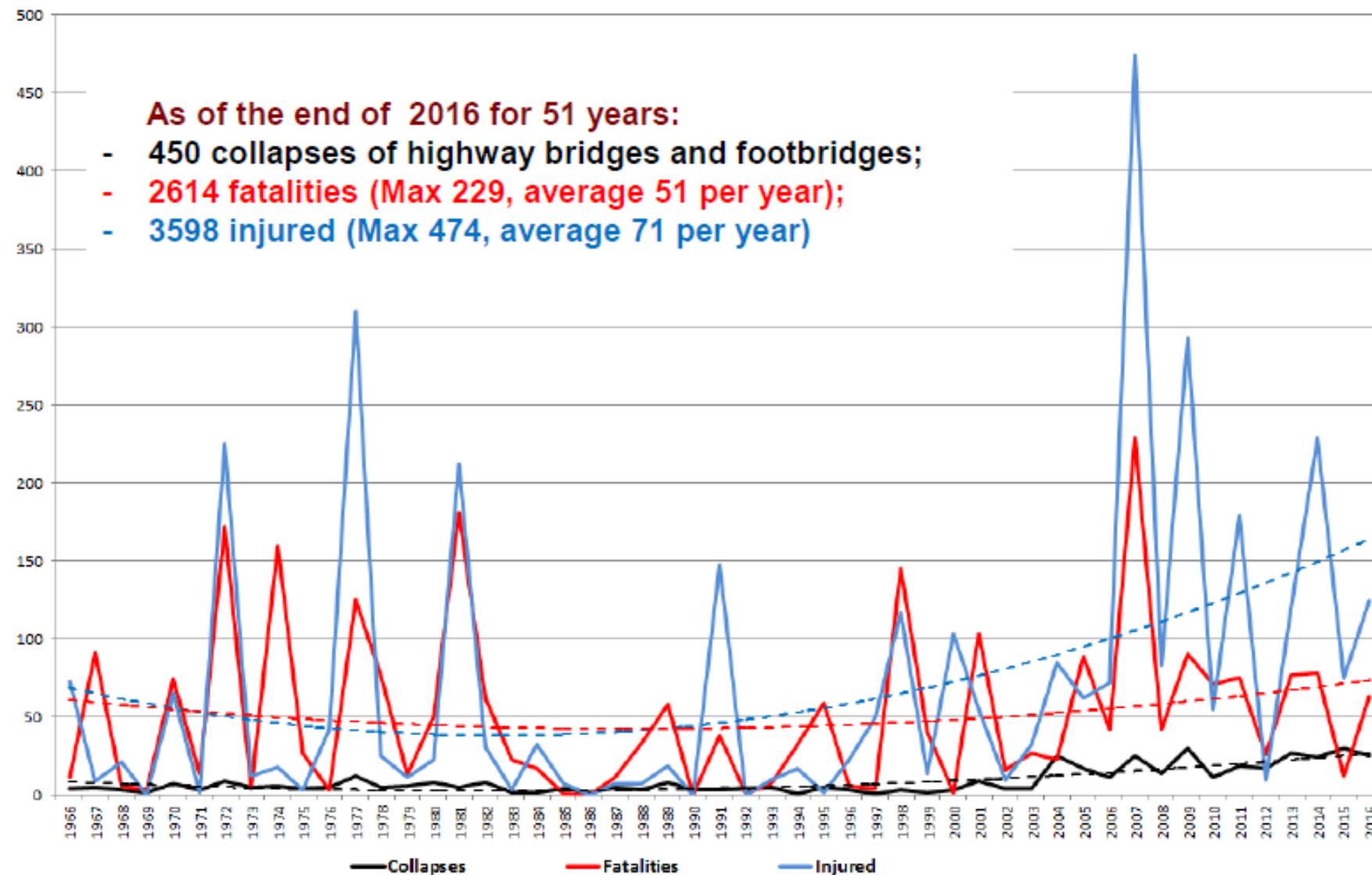


## Our objectives :

- **Gathering & Compilation (Global Data Base)** of available data and information.
- **Analysis** of the Global Data Base.
- **Conclusions** from the Analysis.
- **Recommendations** for the Life-Cycle Safety and Security.

# Data collection as of the end of 2016 for 51 years

## Collapses occurred over 1966 – 2016 and consequences for human life and health



# Miami bridge collapse 2018





<https://www.youtube.com/watch?v=hBjntrebxxj8>  
<https://www.youtube.com/watch?v=fdUf-el9vA>



# National Transportation Safety Board

- Chief probable cause was the design
- The checking engineer review was inadequate
- The designer, the builder, the builder's engineering consultant, the university, and the Florida Department of Transportation — failed to recognize that the cracking had reached unacceptable levels

# Tower Block Tragedies



Ronan Point 1968



Grenfell Tower 2017

# Initial Government Actions

- The Grenfell Tower Inquiry - independent public inquiry by Judge Sir Martin Moore-Bick
  - Phase 1 – what happened complete
  - Phase 2 – why did it happen; started
- The Independent Review of Building Regulations and Fire Safety led by Dame Judith Hackitt



# Hackitt Recommendations

## SCOSS Alert Building a Safer Future

**A global concern**  
safety

UK is by no means alone in needing to improve building

- Stronger and tougher regulatory framework
- New Joint Regulatory Authority
- Safety case approach for HRRBs
- Clear responsibilities to actively manage on-going safety
- More CROSS reporting
- Golden thread linking all activities

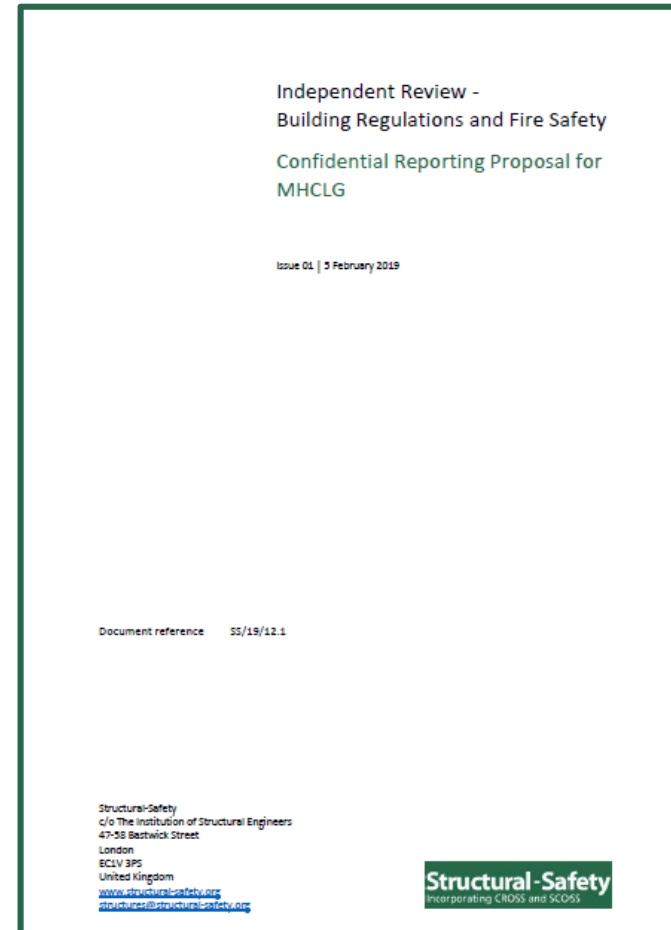
# Queens speech December 2019

## Building Safety Bill

- Put in place new and enhanced regulatory regimes for building safety and construction products
- Learning the lessons from the Grenfell Tower fire and strengthening the whole regulatory system for building safety
- Changing the industry culture to ensure accountability and responsibility and ensuring residents are safe in their homes.

# Enhanced Safety Reporting

- Mandatory reporting to JRG:
  - Legal requirement to report
  - Just Culture
  - Prescribed concerns and events
- Voluntary confidential reporting:
  - All other concerns and events
  - CROSS - structural safety
  - CROSS - fire safety
- Residents voices



In 2019 it was estimated that an enhanced regime for high rise residential buildings would apply to over 11,000 such buildings, rising to almost 15,000 within 10 years.



# CROSS – Fire Safety

- In conjunction with the Institution of Fire Engineers
- National Fire Chiefs Council
- Government
- Considerations:
  - Scope
  - Who should report
  - Type of event
  - Type of concern
  - Dissemination





# The Cube fire Bolton 2019



<https://www.youtube.com/watch?v=3UHSOHxJNwo>

# Government statement January 2020

- The Health and Safety Executive (HSE) will quickly begin to establish the new regulator in shadow form immediately.
- It will raise building safety and performance standards, including overseeing a new, more stringent regime for higher-risk buildings.
- Dame Judith Hackitt will chair a Board to oversee the transition.



# Boeing 737 Max 8 – systemic failure

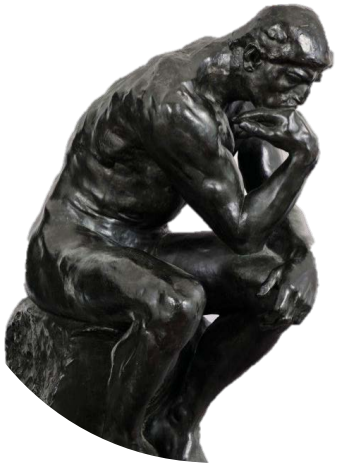


- Lion Air Indonesia 189 deaths
- Ethiopian Airlines 157 deaths
- Consequences for Boeing



## Changing construction industry culture

- Better leadership at all levels
- Quality is critical
- Less emphasis on profit
- Stronger relationships with Regulators



## Reflective thinking

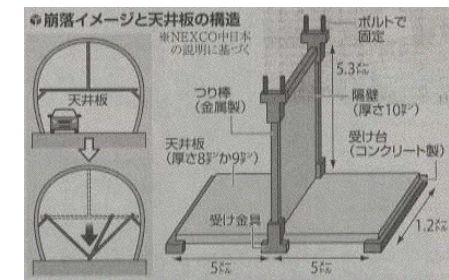
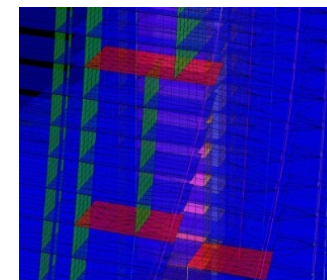
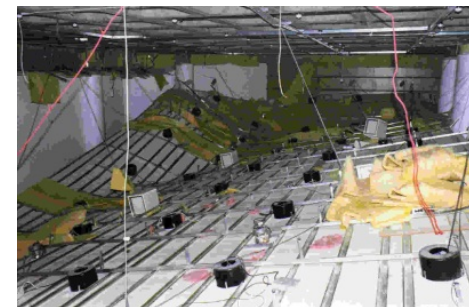
- Consider risks of both known and unforeseen events
- Consider the risks of unexpected consequences
- Review risk when circumstances change e.g. new materials, new forms of construction, emerging technologies
- Release safety-critical information that could help others - CROSS



# CROSS International







[www.structural.safety.org](http://www.structural.safety.org)

 [structsafe](https://twitter.com/structsafe)

 [Structural-Safety](https://www.linkedin.com/company/Structural-Safety)