CROSS

Confidential Reporting on Structural Safety

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Director: Structural-Safety

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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

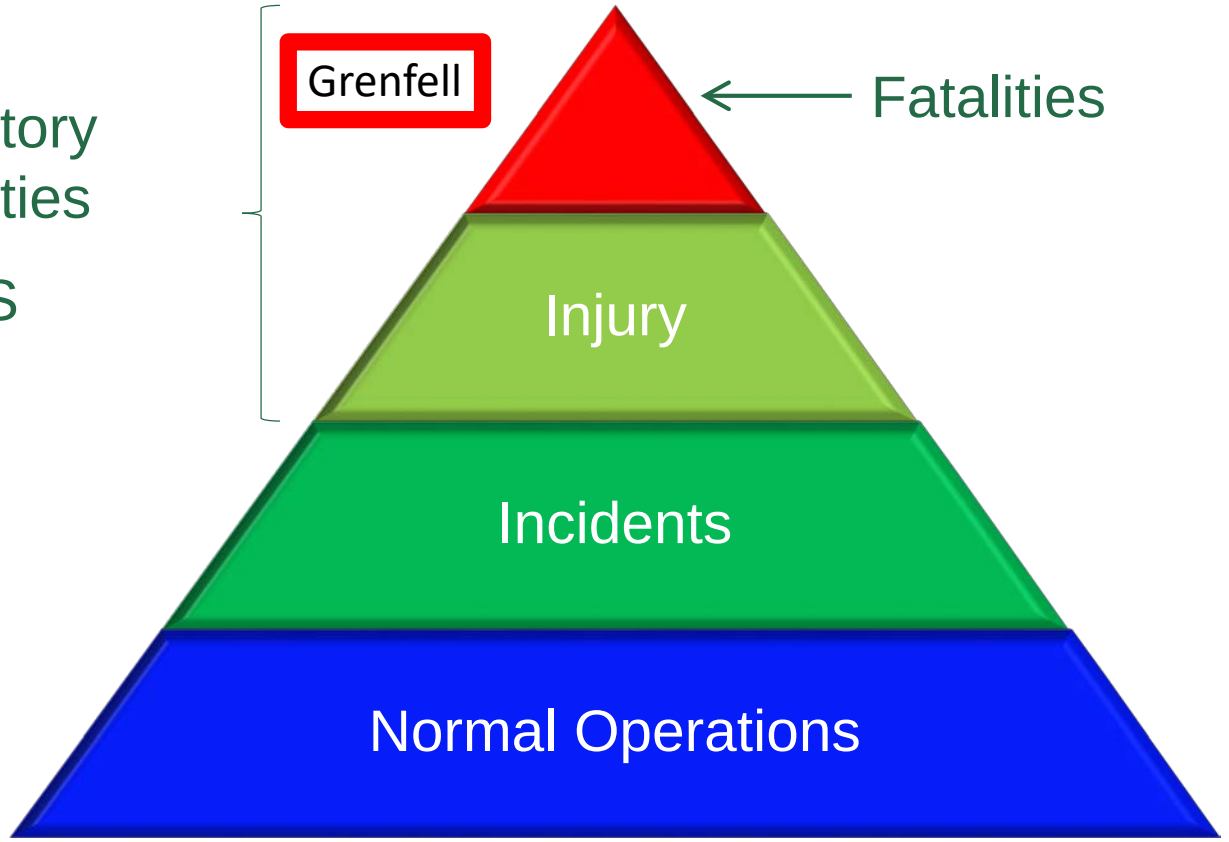
CROSS

Confidential Reporting on Structural Safety

- Started 2005 (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



Regulatory Authorities

SCOSS

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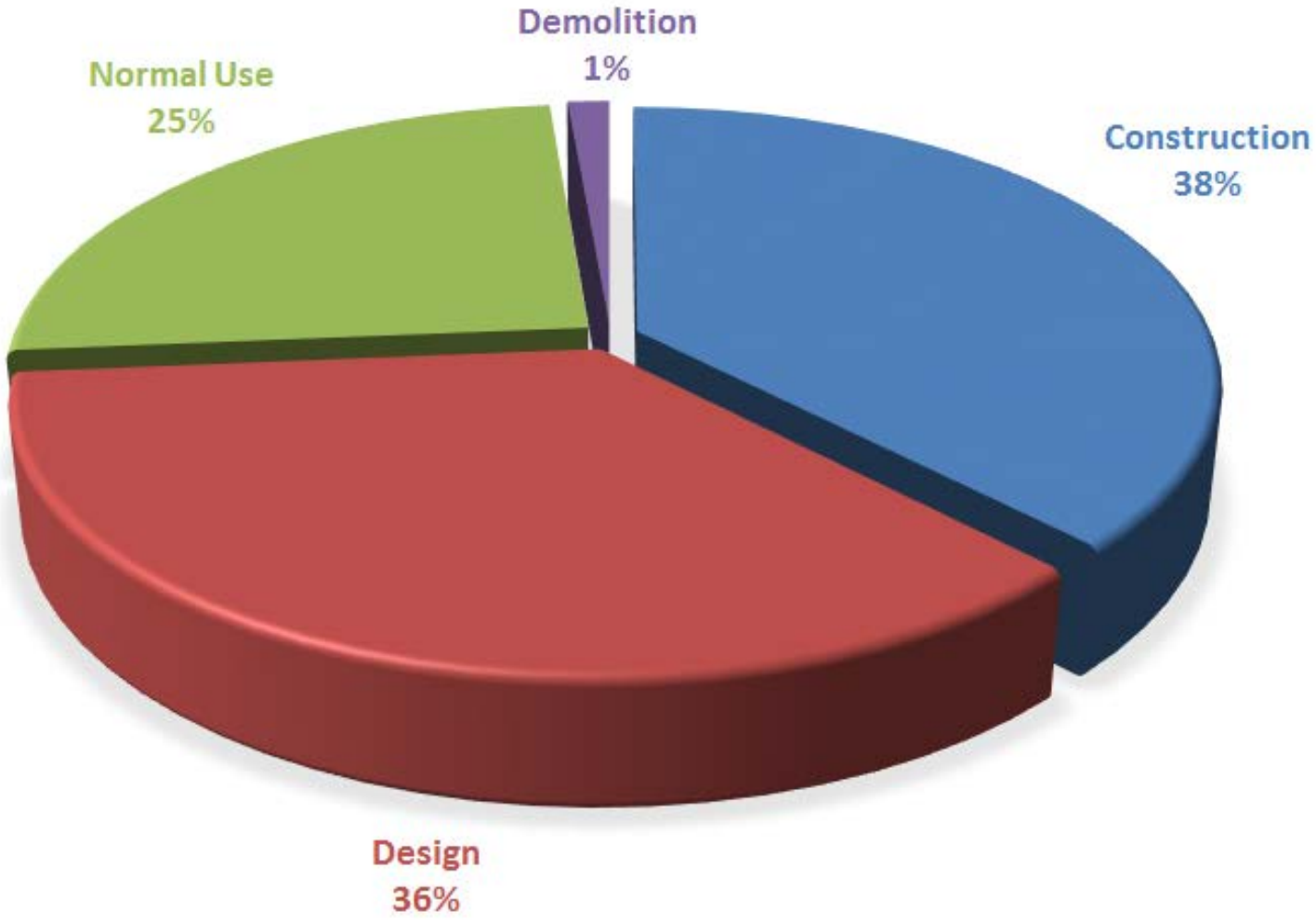
Precursors*

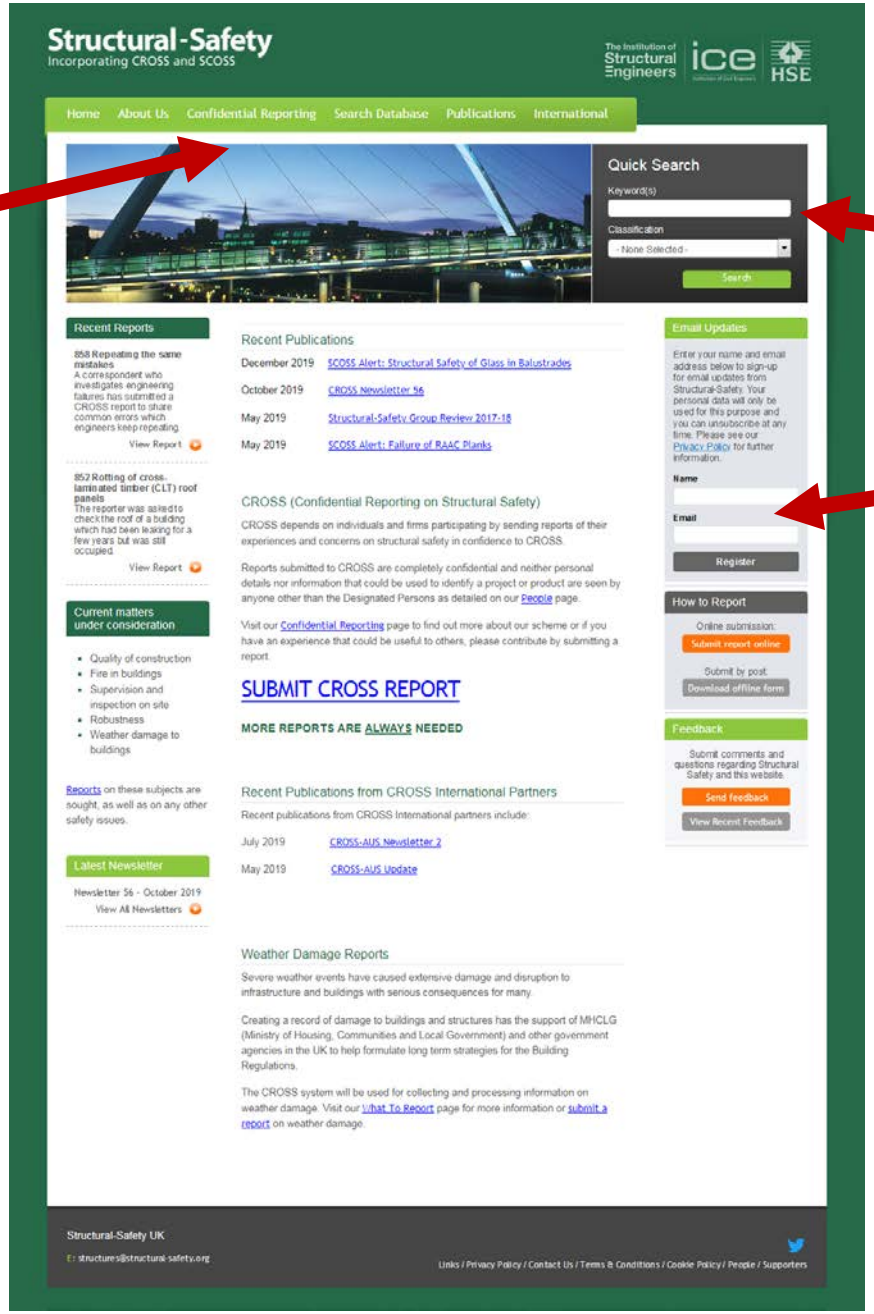
Diagram courtesy of ASRS

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

Reported Concerns or Events



Reporting page

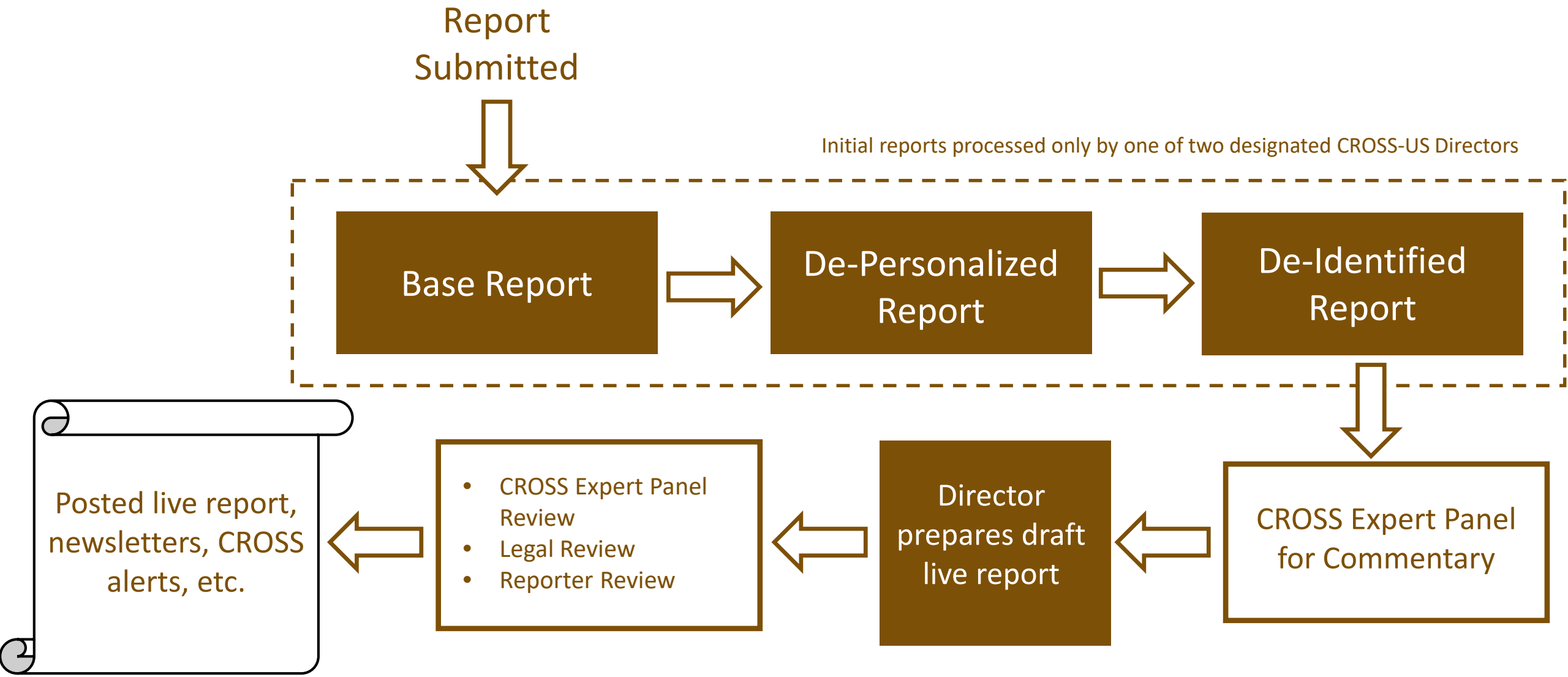


Search data base

Register

www.structural-safety.org

Processing Reports

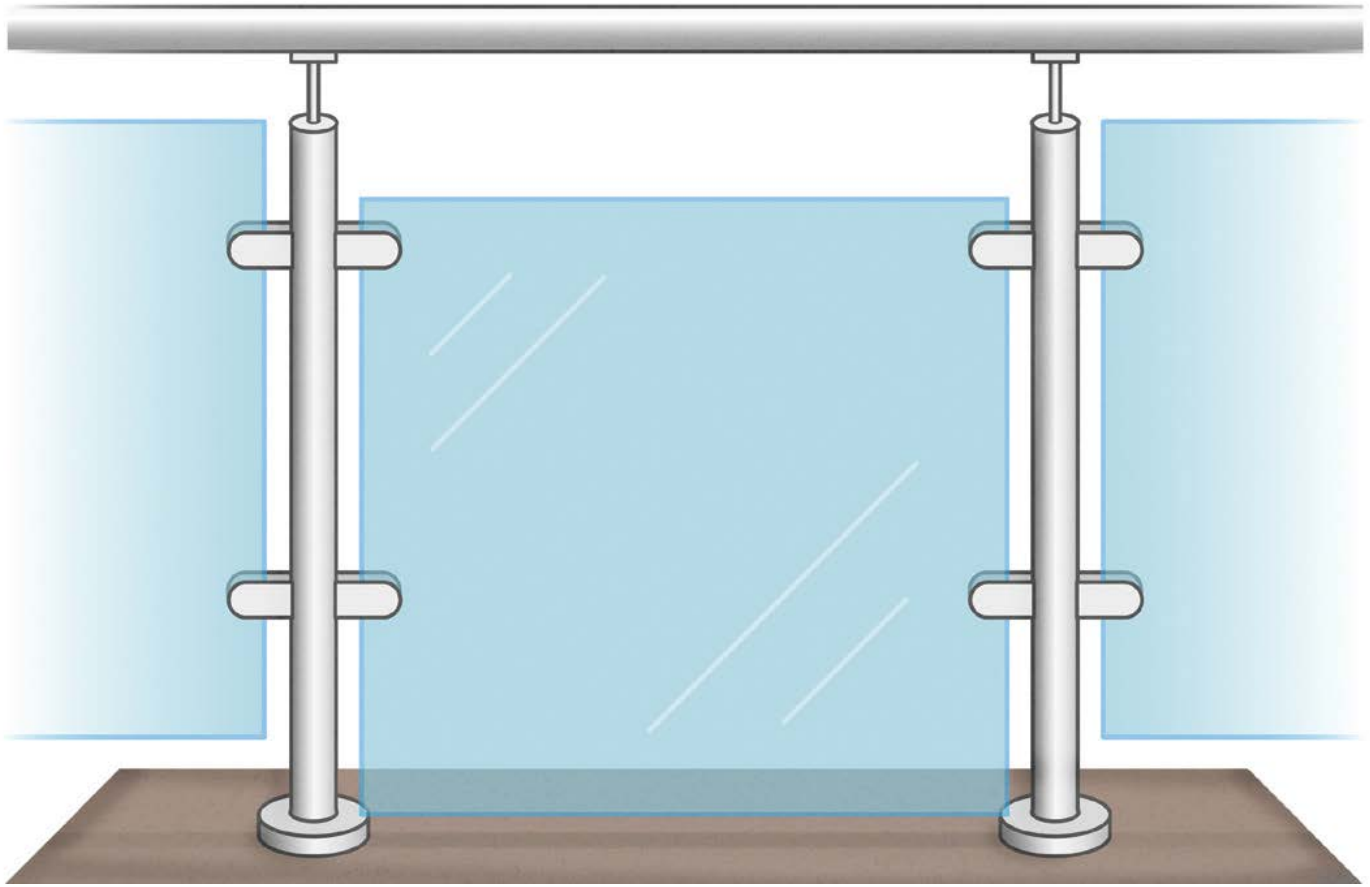


Alert: Failure of RAAC Planks - May 2019

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

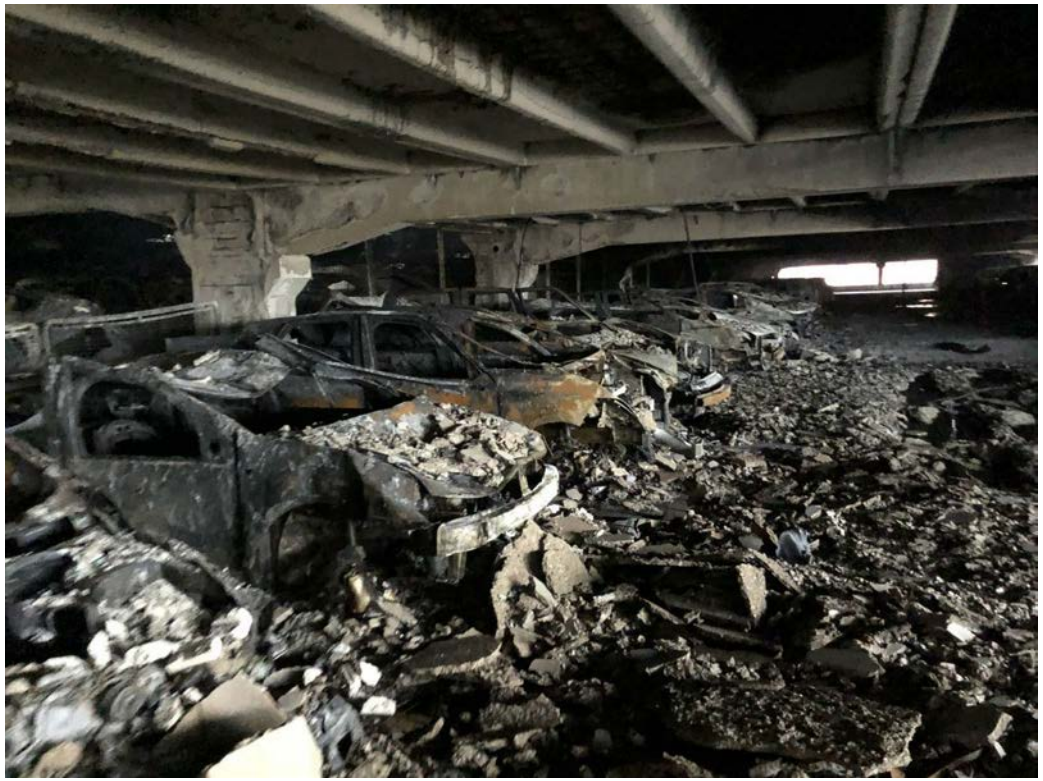
Hydro-carbon fire

1,150 cars destroyed

Demolition 12 months later

Parallels

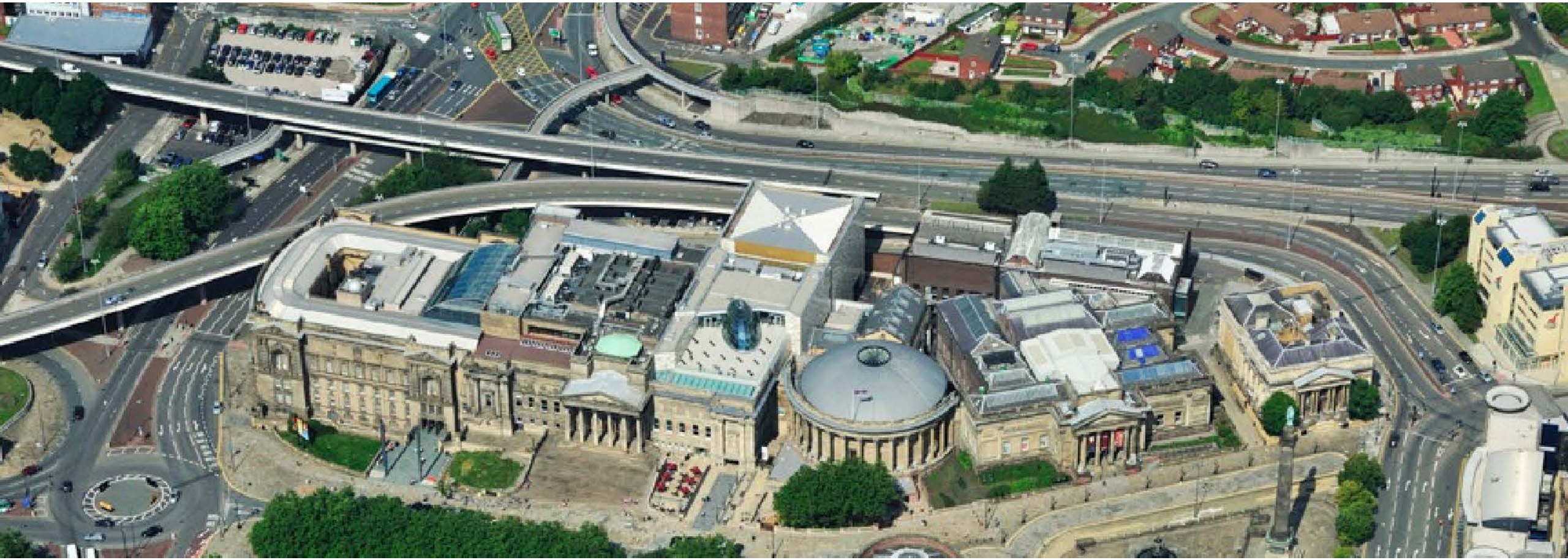
Liverpool UK January 2018



Cork Ireland September 2019

Attribution to Cork Fire Brigade on Twitter

Churchill flyover Liverpool



CONDEMNED:

CHURCHILL WAY FLYOVERS – LIVERPOOL

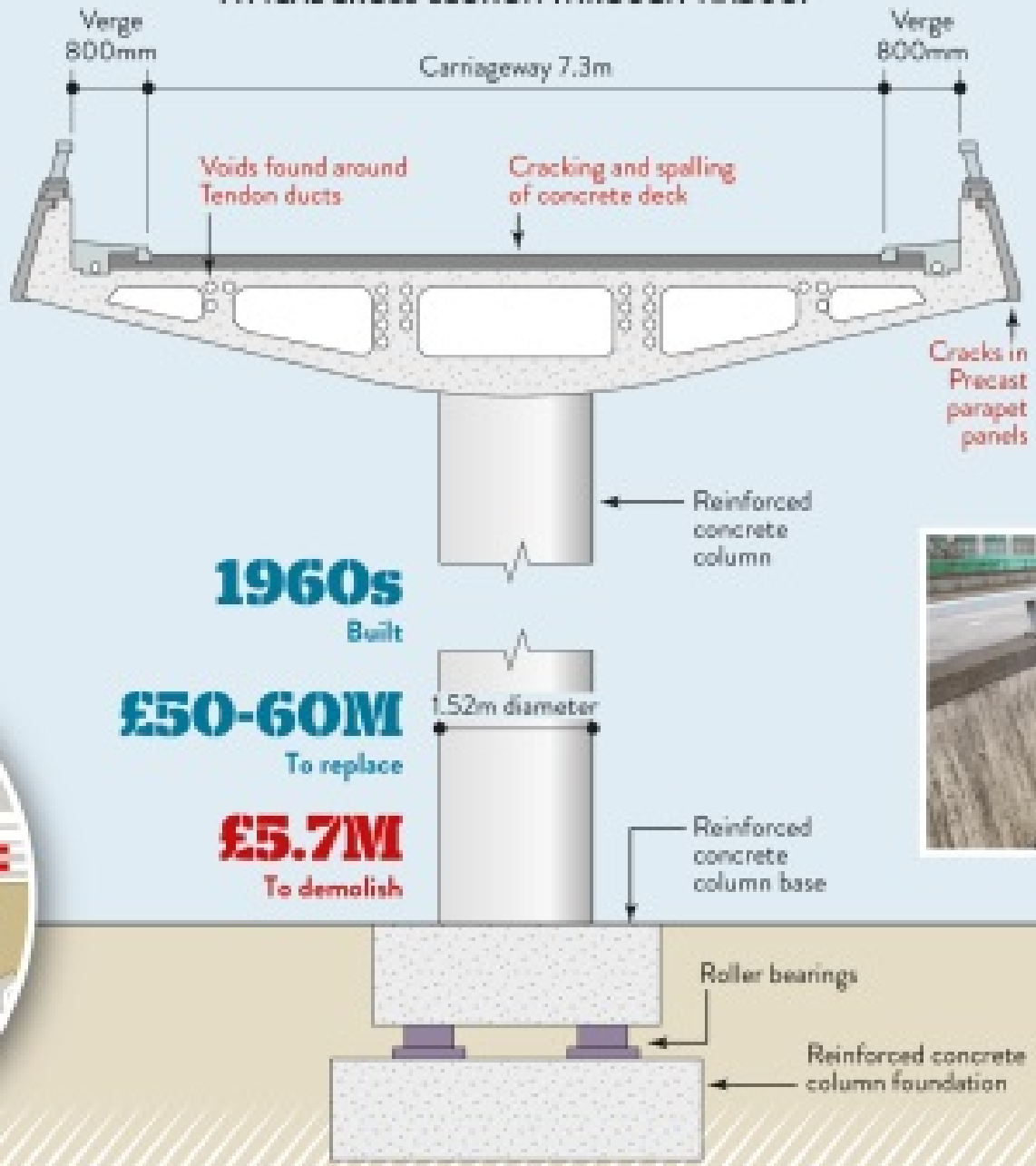
The deserted flyovers

1960s
Built

£50-60M
To replace

£5.7M
To demolish

TYPICAL CROSS-SECTION THROUGH VIADUCT



Green netting on parapets protects cars from falling material

Demolition

Edge panel fixings

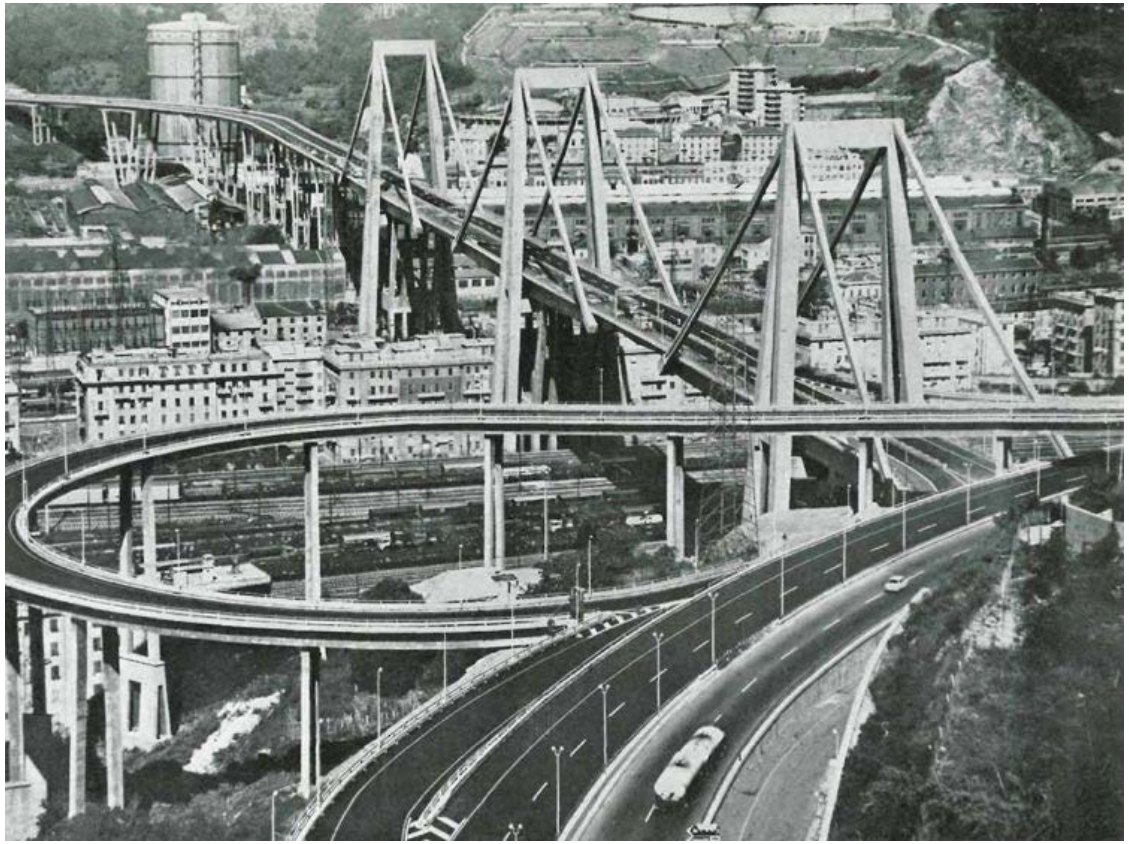
The equipment and the result

Reducing the Risk of Infrastructure

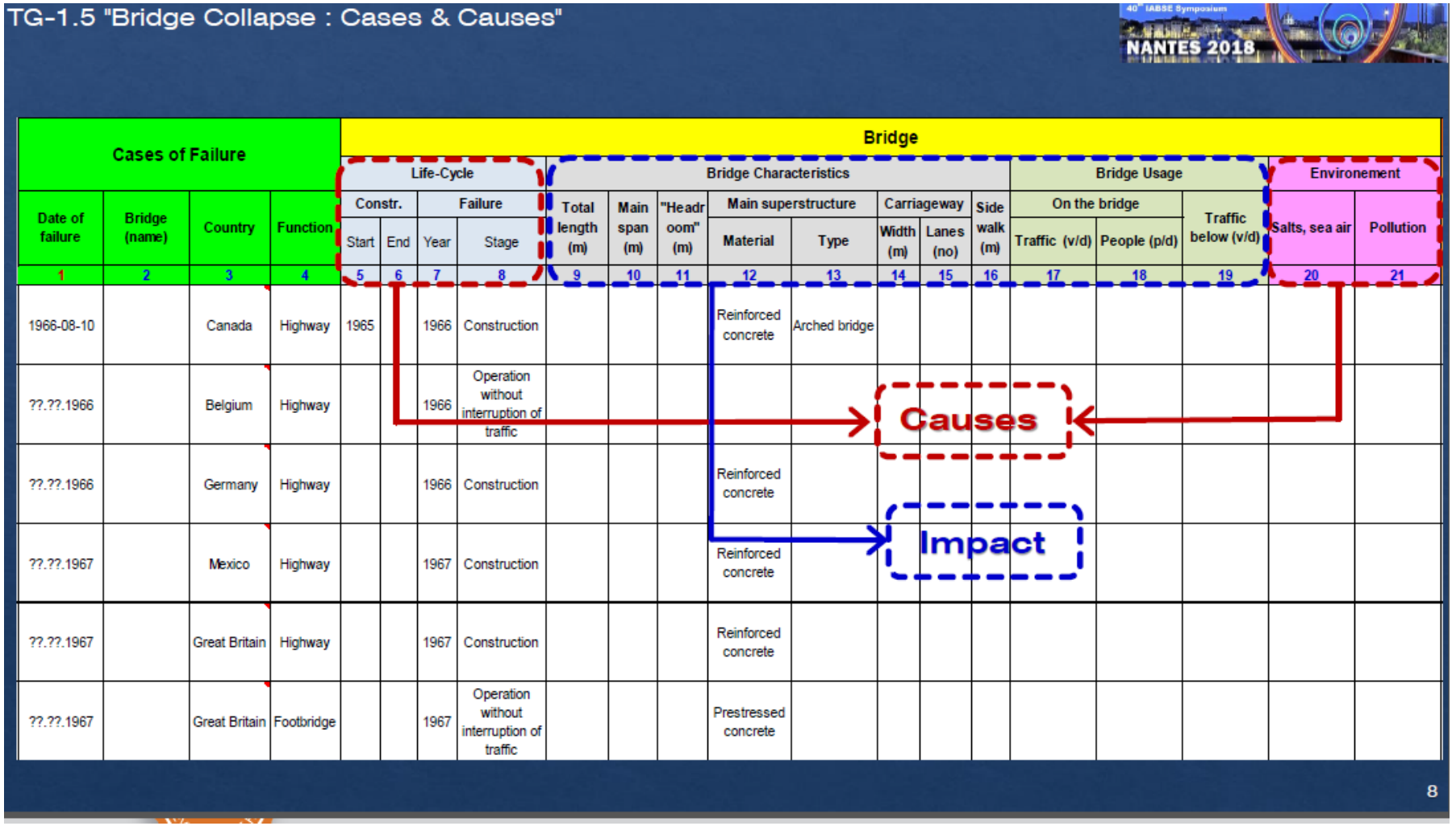
- Risk of a major failure of UK infrastructure is not low enough.
- Recommendation: Build on the work of CROSS

Whaley Bridge Dam UK August 2019

Grim reminder – Polcevera viaduct



Russian data base on bridge collapses

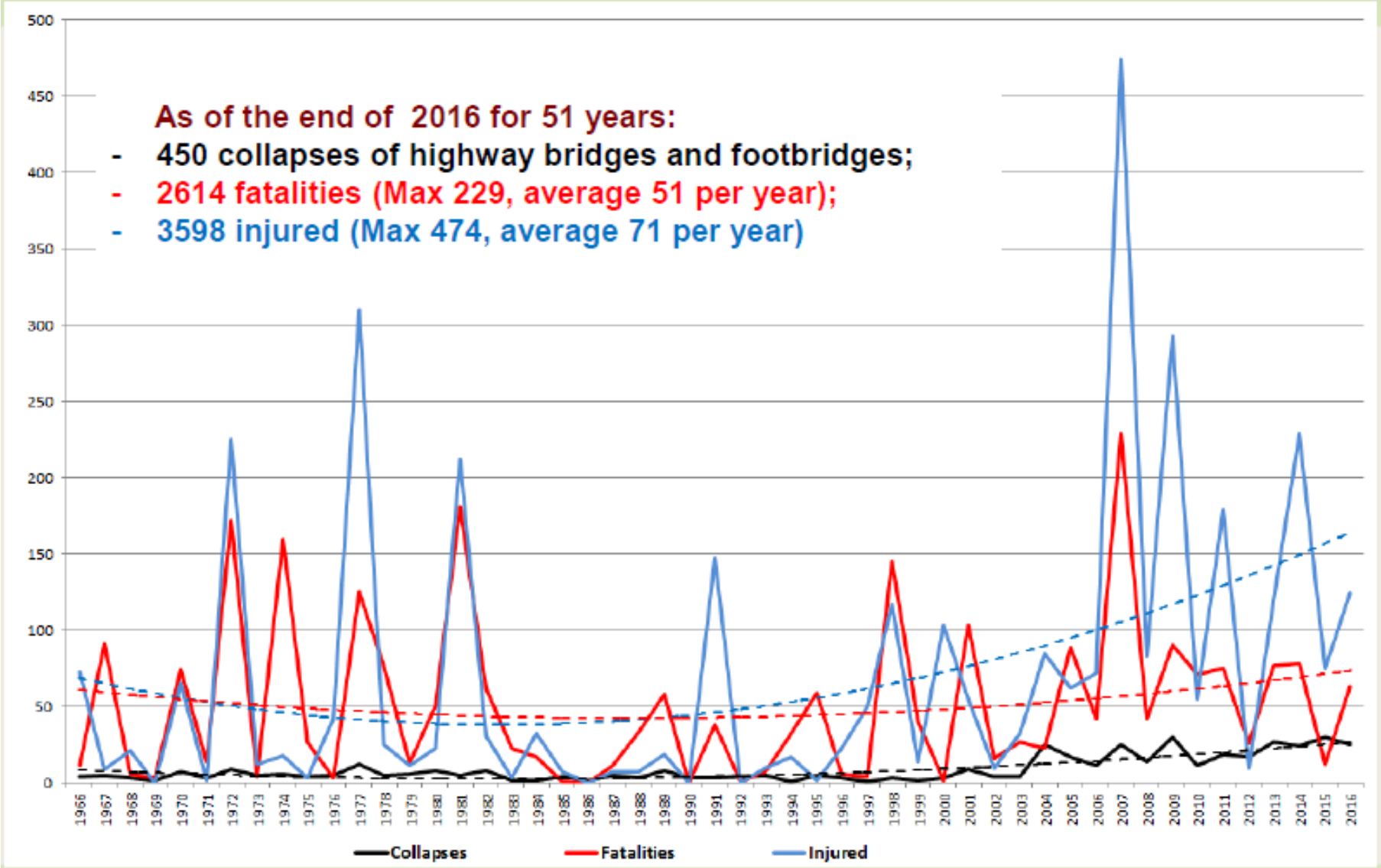


Cases of Failure				Bridge																
				Life-Cycle				Bridge Characteristics								Bridge Usage			Environement	
				Constr.		Failure					Main superstructure		Carriageway			On the bridge				
Date of failure	Bridge (name)	Country	Function	Start	End	Year	Stage	Total length (m)	Main span (m)	"Headroom" (m)	Material	Type	Width (m)	Lanes (no)	Side walk (m)	Traffic (v/d)	People (p/d)	Traffic below (v/d)	Salts, sea air	Pollution
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



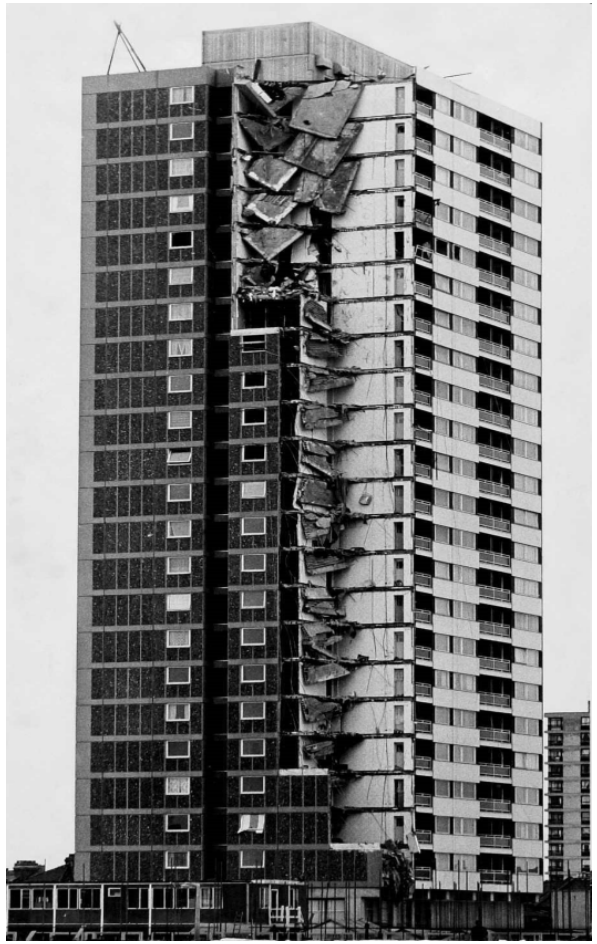
Miami bridge collapse 2018

https://www.youtube.com/watch?v=hBjntrebxj8
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

- 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

SCOSS Alert Building a Safer Future

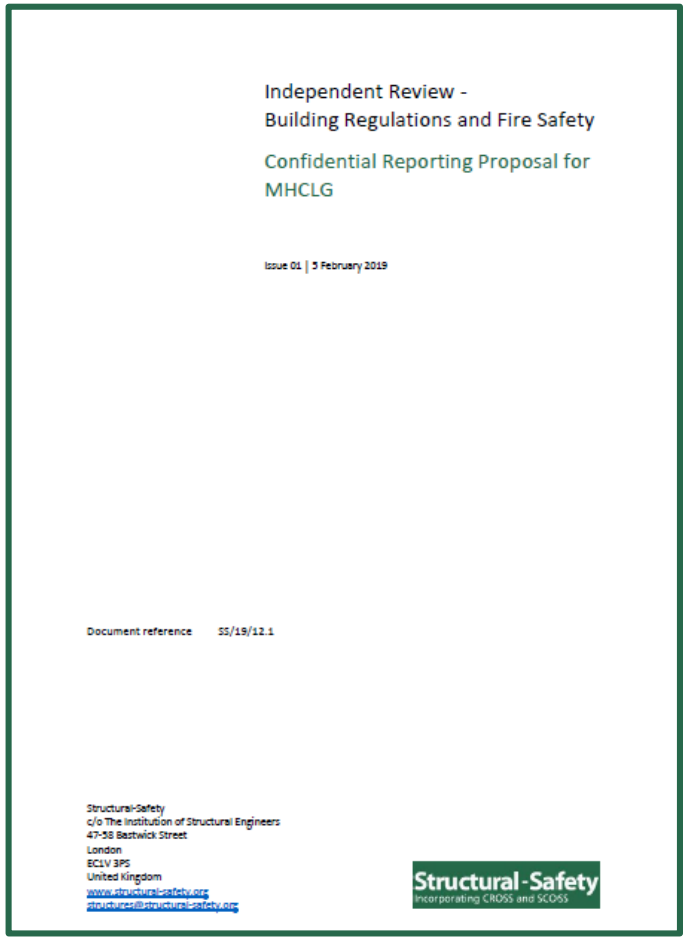
A global concern UK is by no means alone in needing to improve building safety

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



Independent Review -
Building Regulations and Fire Safety

Confidential Reporting Proposal for MHCLG

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Structural-Safety
Incorporating CROSS and SCOSS

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

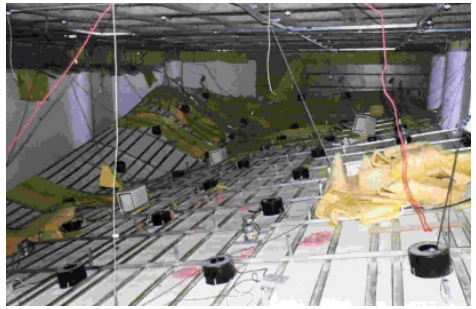
- Better leadership at all levels
- Quality is critical
- Less emphasis on profit
- Stronger relationships with Regulators

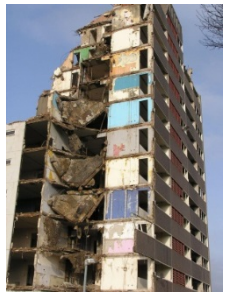
Reflective thinking

- 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

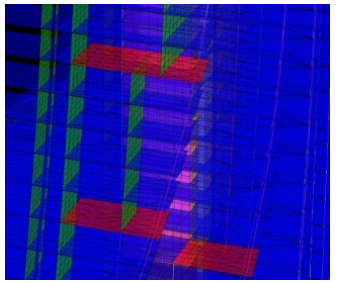
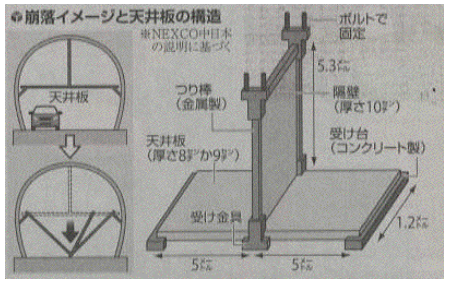
CROSS International






CROSS INTERNATIONAL





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