

Building a Safer Future

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SCOSS

Standing Committee on Structural Safety

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

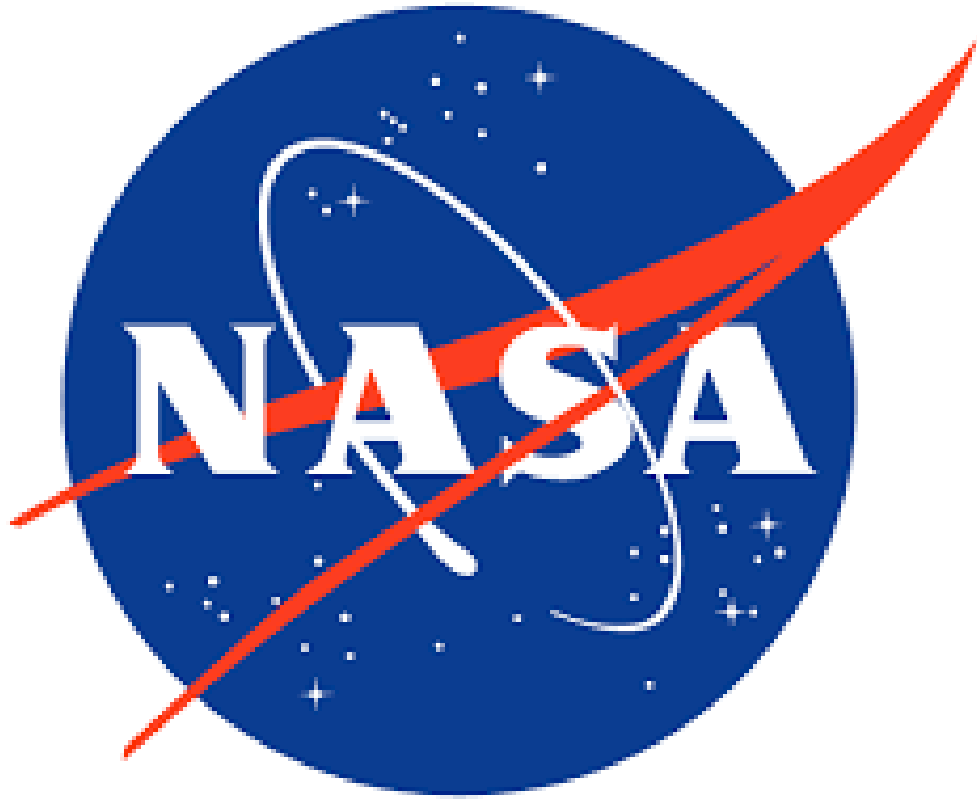
CROSS

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

Aviation Safety Reporting System



Pyramid of Risk

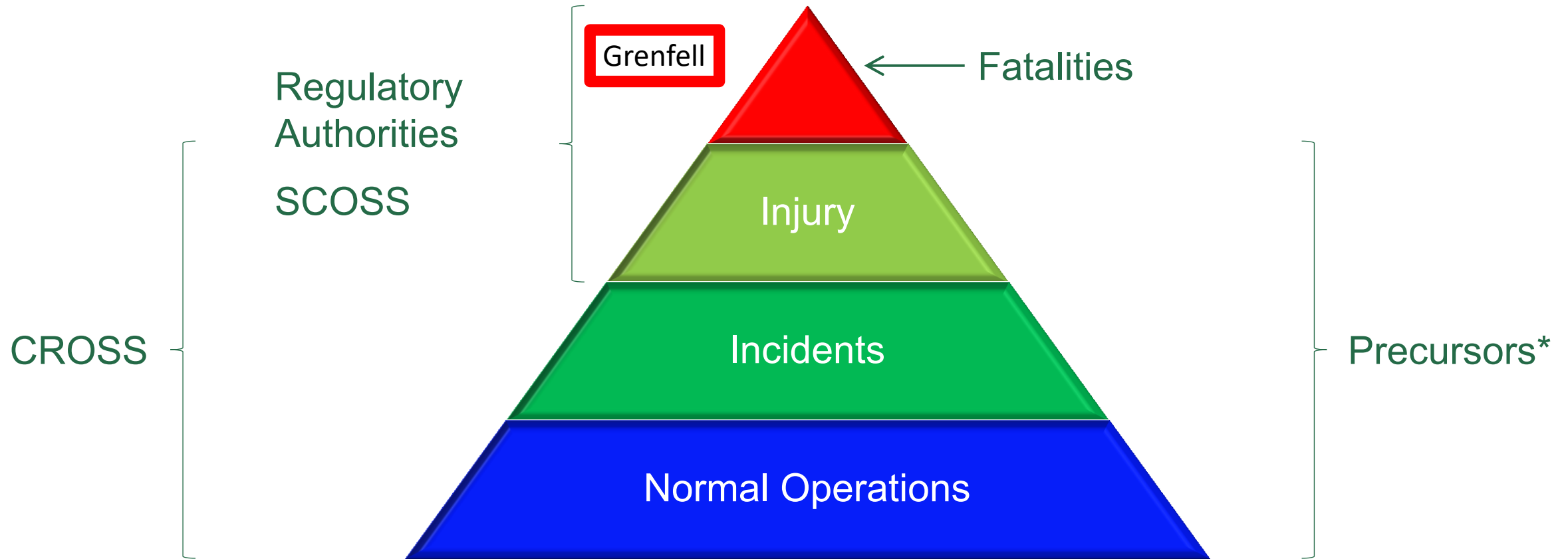
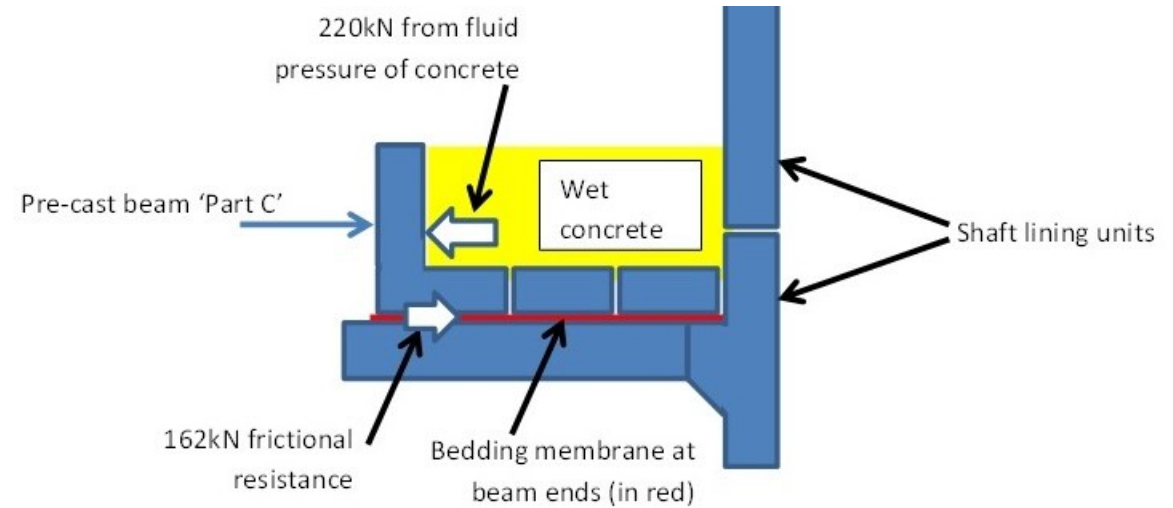
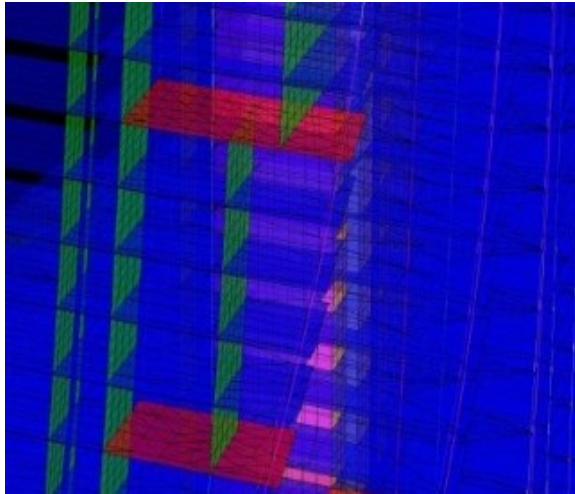


Diagram courtesy of ASRS

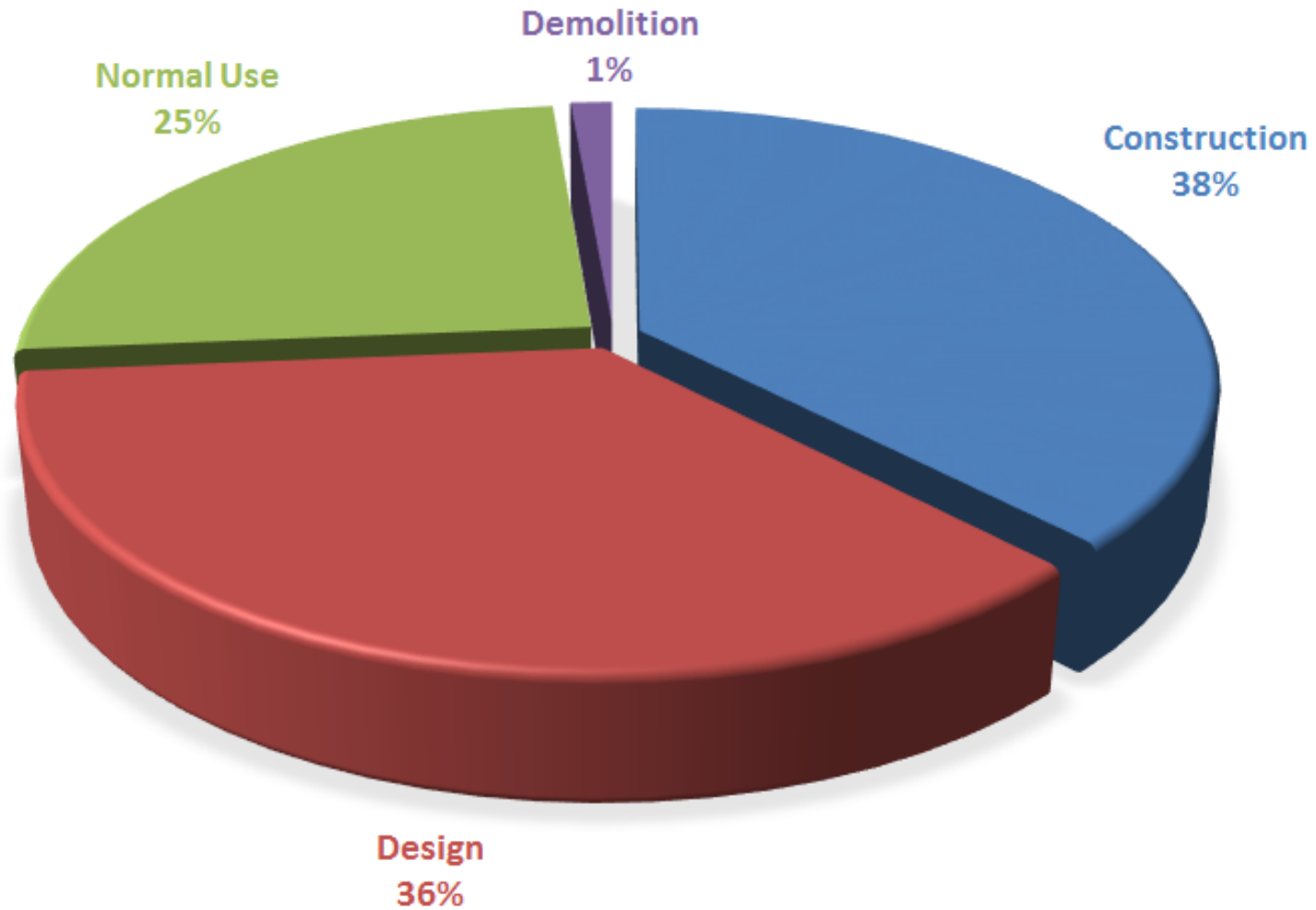
* Precursors should be reported internally and can be reported to CROSS

From Design to End of Life





Reported Concerns or Events



City Gates - SCOSS Alert

Structural Stability/Integrity of Steel Frame Buildings



City Gates - SCOSS Alert Sudden Collapse



Edinburgh Schools - 2016



Tower Block Tragedies



Ronan Point 1968



Grenfell Tower 2017

Key issues

Ronan Point

- Large Panel Structure with no inherent robustness
- Progressive collapse following relatively minor gas explosion
- World-wide influence on robustness
- Remaining LPS buildings now under renewed scrutiny

Grenfell Tower

- Multiple fire risk problems
- Divided responsibilities
- Immense societal implications
- Fire safety world-wide will change
- Building Regulations will change
- Attitude to risk will change

design, construction, management in use, and ownership

Initial Government actions

- The Grenfell Tower Inquiry - independent public inquiry
- The Independent Review of Building Regulations and Fire Safety led by Dame Judith Hackitt.

Lakenal House 2009



Precursor

Cladding Fires



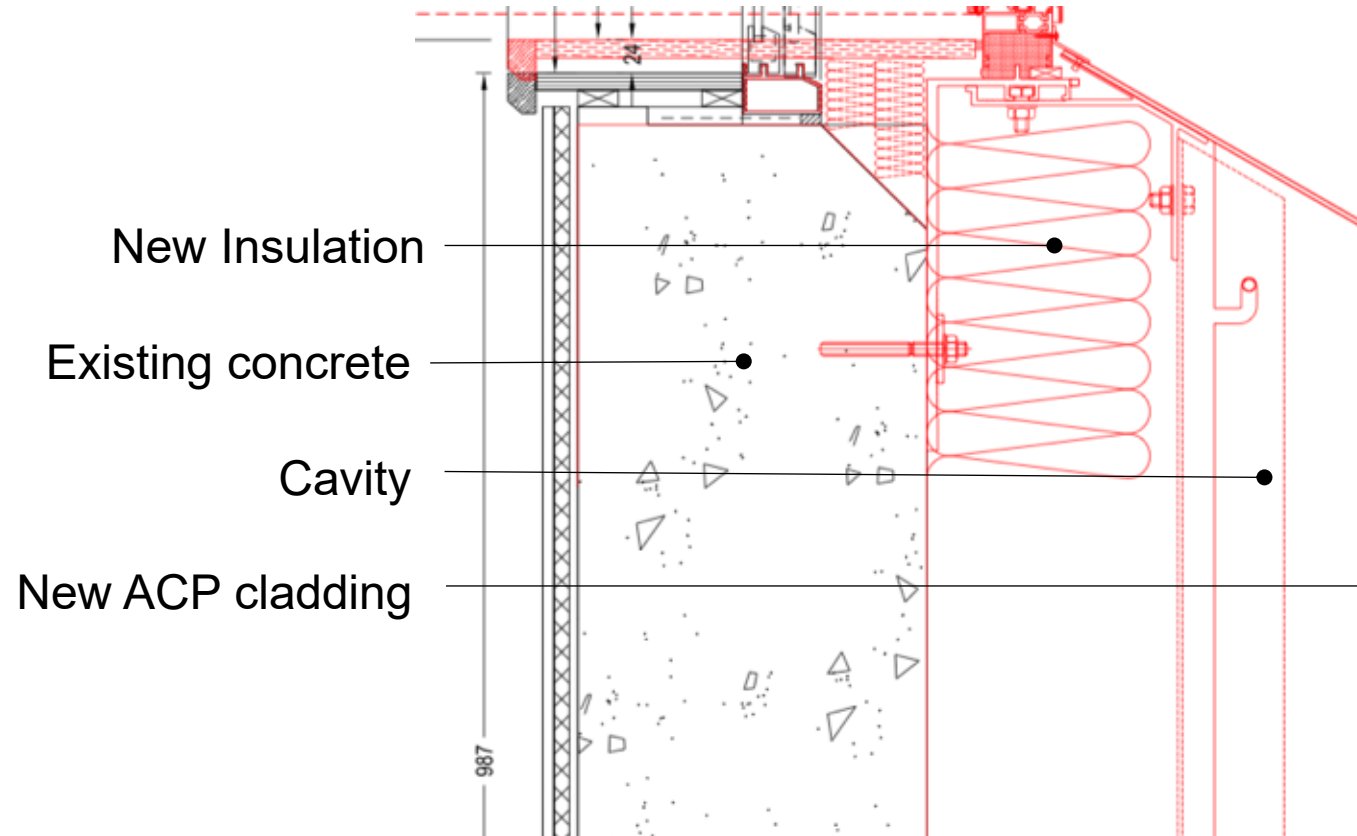
Lacrosse Tower
Melbourne 2014



Dubai hotel 2015

Precursors

Section through Grenfell external wall



© Dr Luke Bisby, The University of Edinburgh, luke.bisby@ed.ac.uk

DCLG/BRE Fire Tests 2017



Test No. 1 Stopped After 395 Seconds - Failed

100 mm rigid
polyisocyanurate (PIR)
foam insulation boards

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



Test No. 4 Stopped After 1 Hour - Passed

180mm stone wool
insulation board

4mm ACM panels
with fire retardant filler



Liverpool Echo Arena Car Park Fire - December 2017



Liverpool Echo Arena Car Park Fire - December 2017

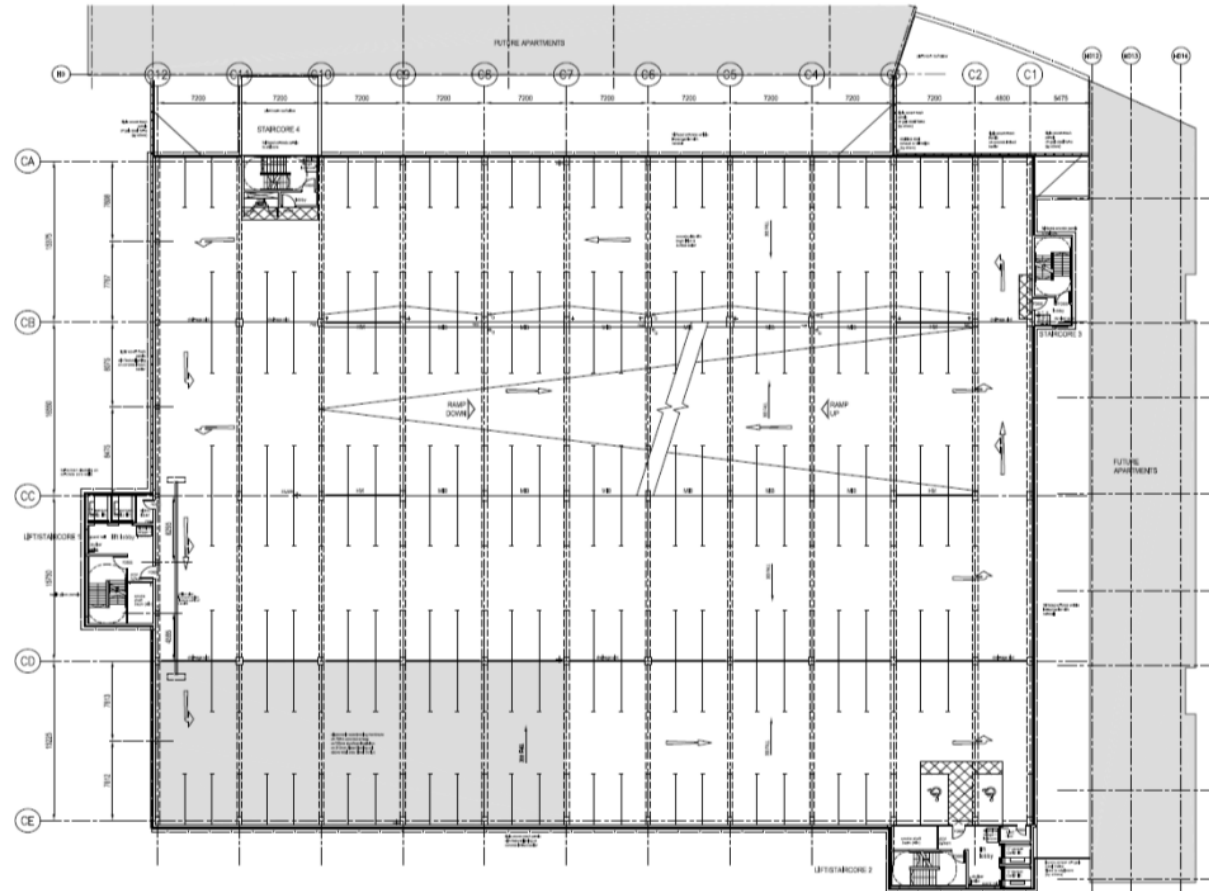


Hydro-carbon fire

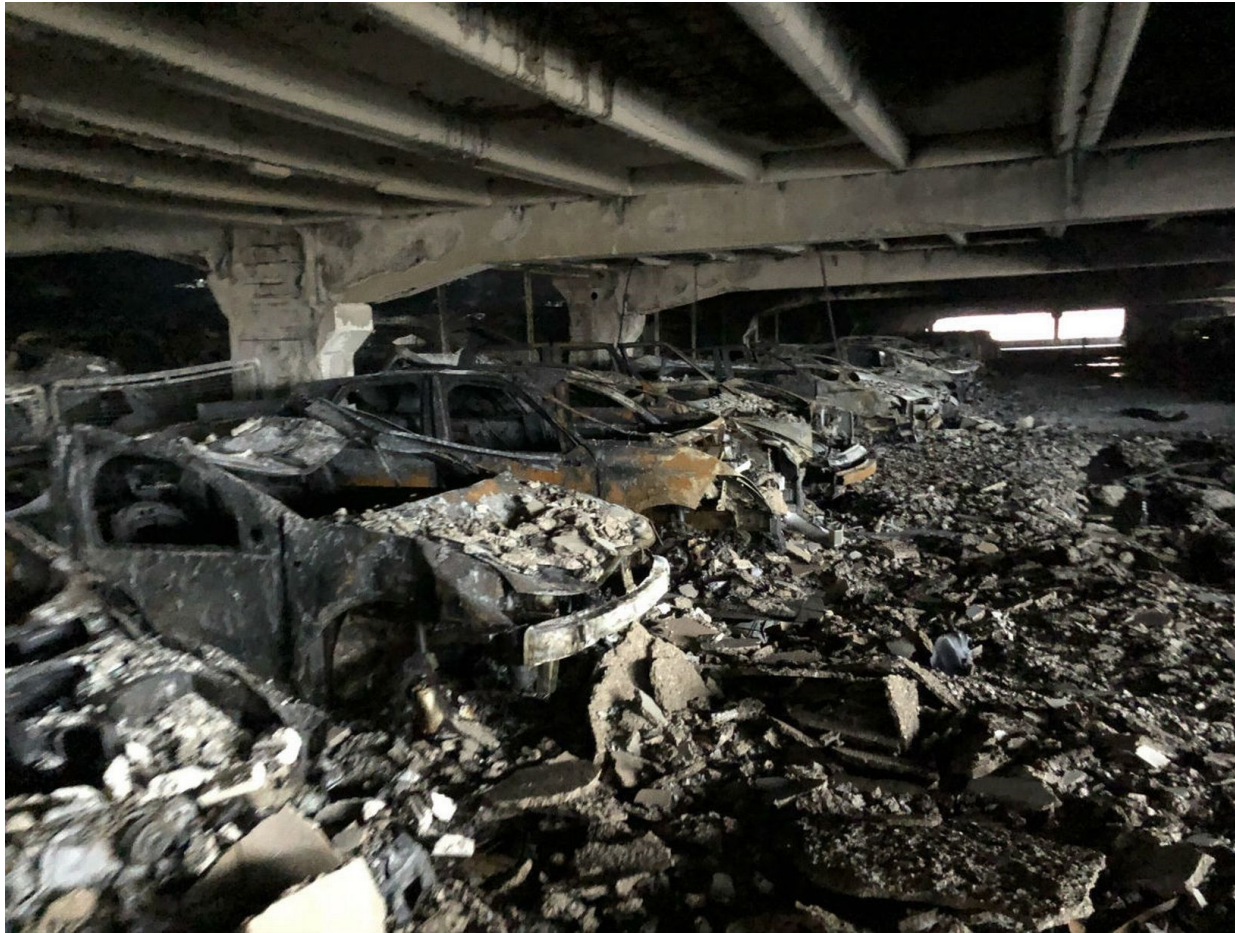
1,150 cars destroyed



Typical floor plan



Reinforced concrete construction



Elios collision tolerant drone



Vertical discontinuity



John Hancock Center Chicago Car Fire on 7th Floor – February 2018



ANATOMY OF INFERNO THAT CAUSED MAYHEM FOR MOTORISTS

1 Fire starts at Apex scrapyards under M1 bridge in Mill Hill, North London at 4am on Friday and spreads to skip-hire firm close to junction 3. Discarded cigarette and arson among the theories.

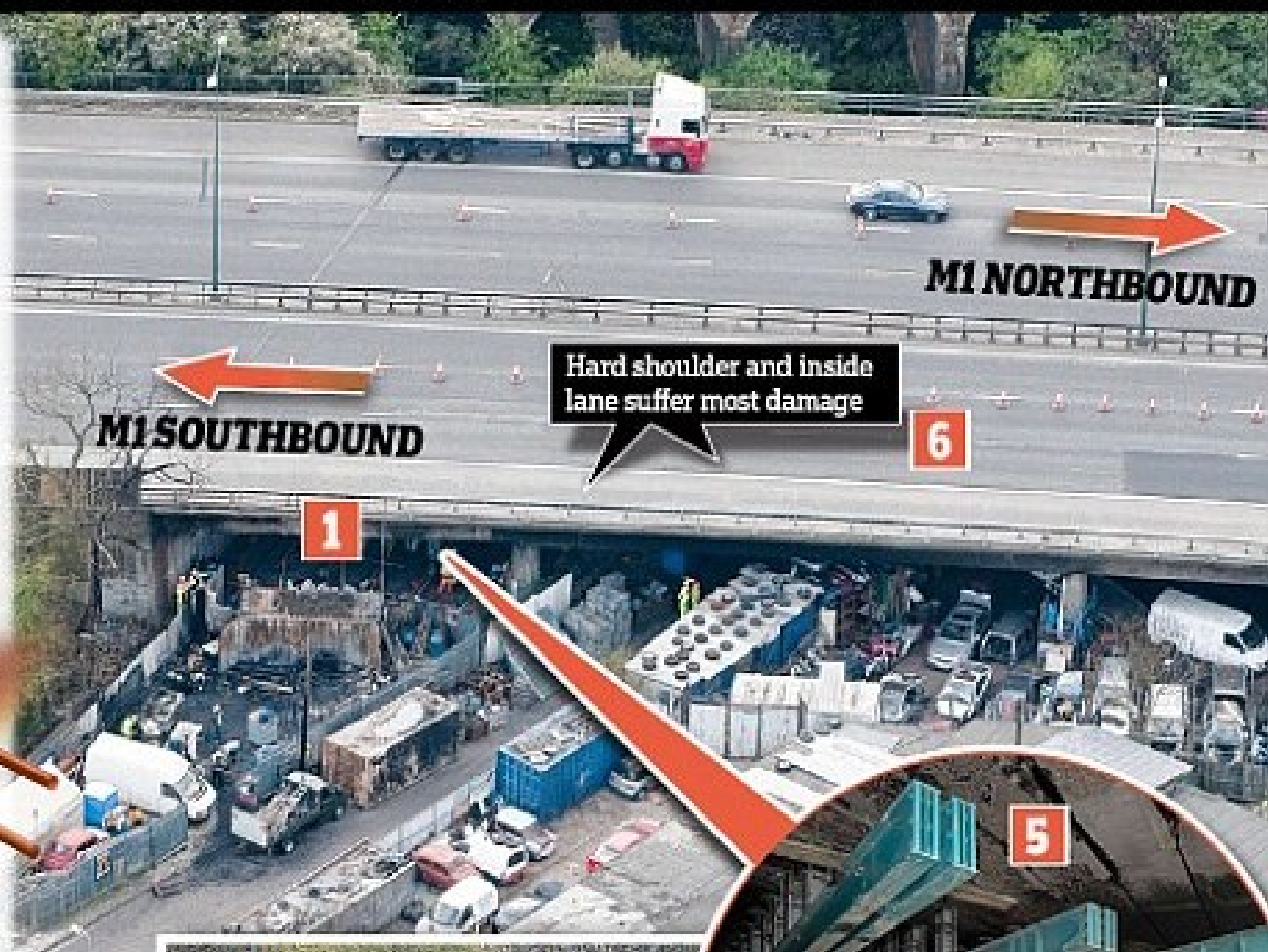
2 Rubbish under flyover burns with intensity of a blast furnace. Temperatures exceed 1,000°C.

3 Steel reinforcement rods inside concrete bridge and support pillars expand so rapidly that the concrete 'explodes'. Tarmac road surface appears unaffected.



3
Steel rods

4 Seven miles of M1 between



M1 SOUTHBOUND

M1 NORTHBOUND

Hard shoulder and inside lane suffer most damage

6

1

5

Hackitt review- Building Regulations and Fire Safety

Evidence submitted by Structural-Safety
and IStructE using SCOSS and CROSS data;

- Intrinsically safe by design
- Safe to build
- Safe through life

Final Hackitt Report

- Roles and responsibilities for safety unclear;
- Regulations and guidance are ambiguous;
- Compliance with the regulations is weak;
- Competence is patchy;
- Product testing, labelling and marketing is opaque;
- Residents' voices go unheard, even when safety issues are identified.

Hackitt Recommendations

[SCOSS Alert Building a
Safer Future](#)

- Stronger and tougher regulatory framework
- New Joint Regulatory Group(JCA) [Originally JCA]
- Safety case approach
- Clear responsibilities to manage on-going safety
- CROSS reporting for all buildingd
- Golden thread

Eindhoven Airport Car Park - 2017



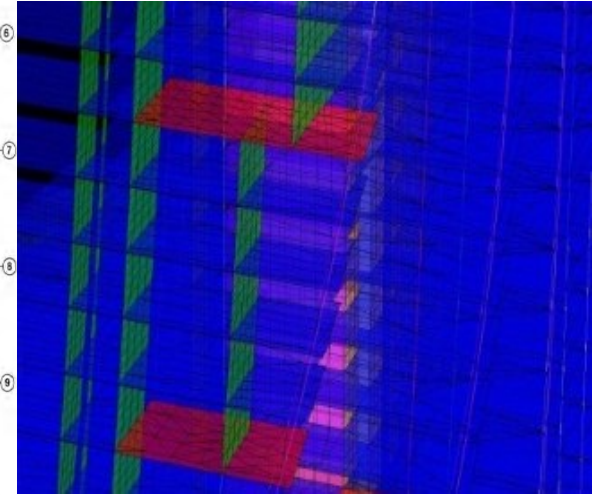
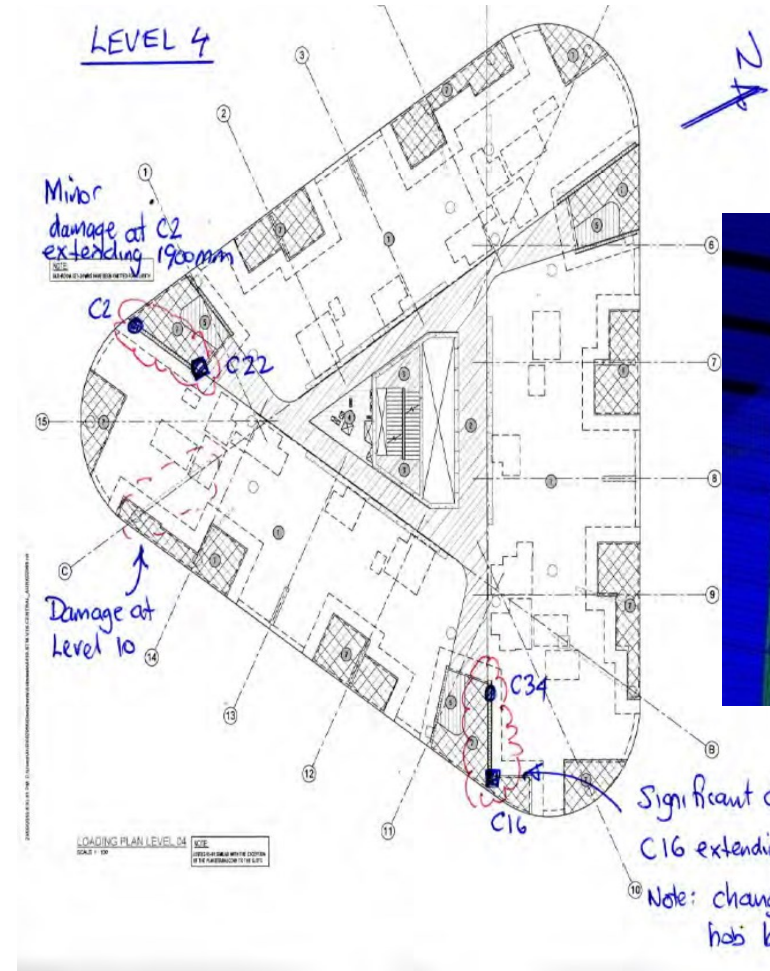
Dutch Safety Board

- ensuring all forms of safety in construction projects;
- the importance of organising professional discussions;
- the principles of systemic risk management;
- transitioning from a blame culture to a learning culture;
- embedding safety in tendering procedures.
- hold participants explicitly accountable for complying with these principles.

Shergold Weir Report – Australia 2018

“The quality of buildings depends heavily on the competency and integrity of builders.”

Opel Tower Sydney - Christmas 2018



Damaged walls

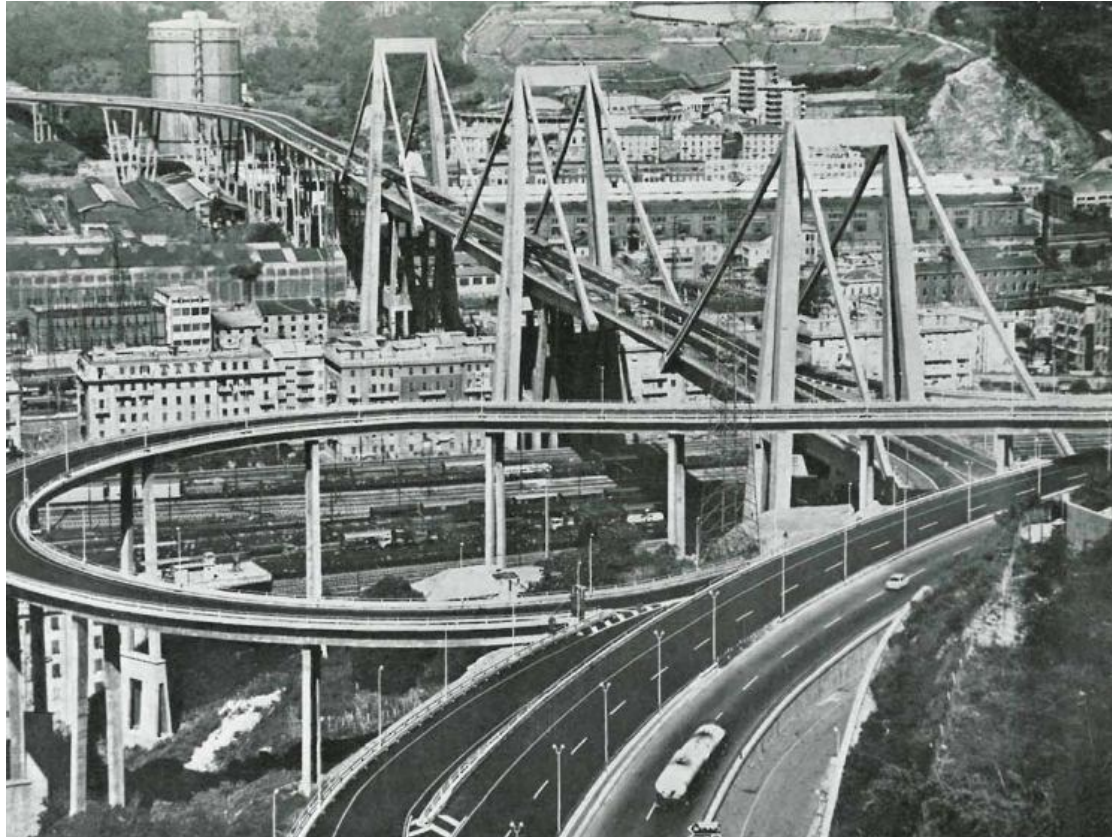
“A number of design and construction issues have been identified, a combination of which probably caused the observed damage.”



In Plain Sight: reducing the risk of infrastructure failure

- Commissioned by ICE
- While the risk of a major failure of UK infrastructure is relatively low, it is still not low enough.
- Build on the work of Structural-Safety

Grim reminder – Polcevera viaduct



Pyramid of Risk

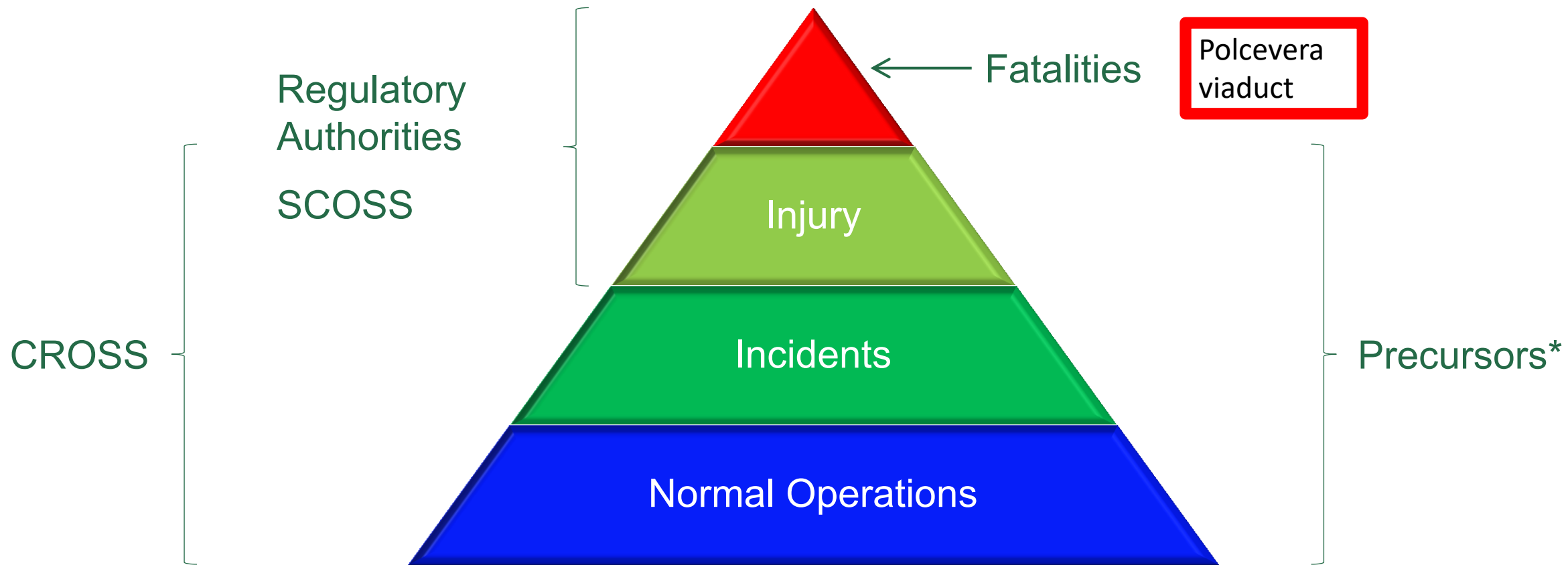


Diagram courtesy of ASRS

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Hong Kong MTR

Commission of Inquiry into the Diaphragm Wall and Platform Slab Construction Works at the Hung Hom Station Extension under the Shatin to Central Link Project



Government Statement on Hackitt

December 2018

- Take forward all of the recommendations in the Hackitt review
- Create a more effective regulatory and accountability framework
- Introduce clearer standards and guidance, including a new Standards Committee
- Put residents at the heart of the new system of building safety
- Help to create a culture change and a more responsible building industry, from design, through to construction and management.

High Rise Residential Buildings (HRRBs)

- Largest category is existing Large Panel Structure Buildings
- Research into numbers and condition underway
- Potential risk is progressive collapse due to gas explosion
- Other risks may exist
- Programme of assessment to be undertaken
- Safety case analysis
- Complex task.

LPS Buildings Haringey



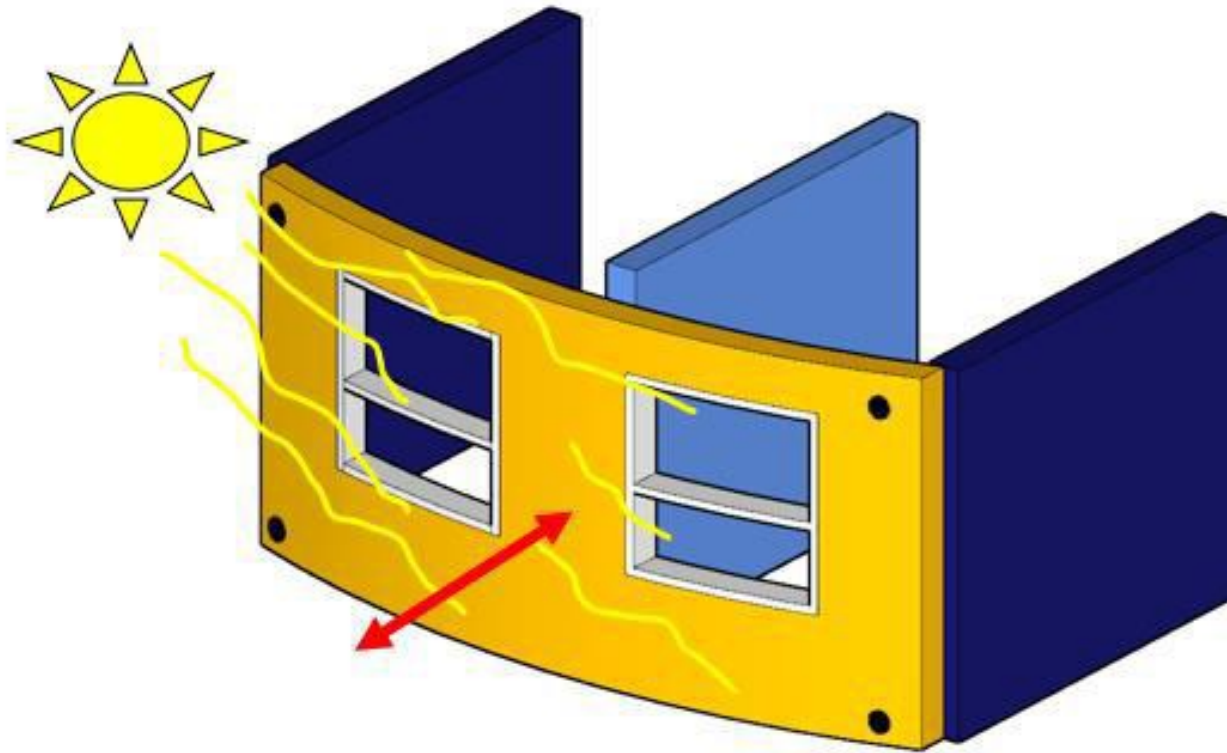
LPS Building Portsmouth



LPS Buildings Ledbury Towers



Initial concern



Pyramid of Risk

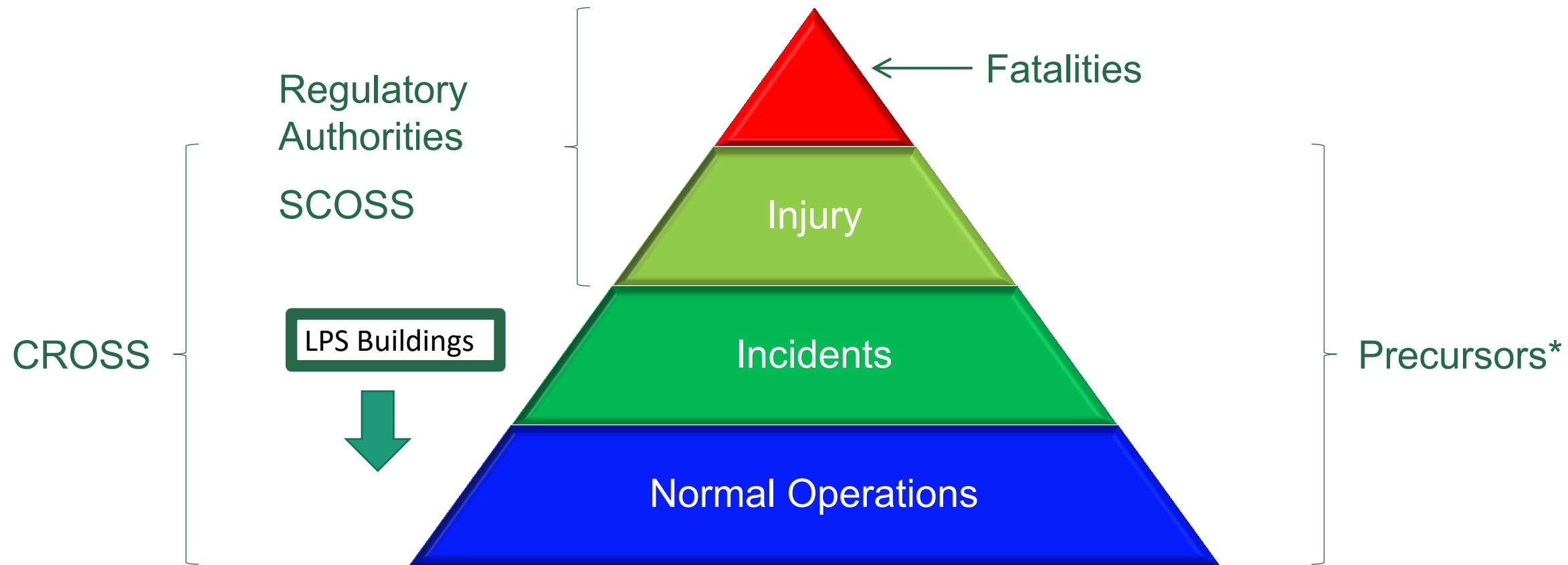


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LPS demolition 2009 – CROSS report



LPS gas explosion Astrakhan Russia 2012



<https://www.dailymail.co.uk/news/article-2107318/Two-dead-11-missing-blast-rips-old-Soviet-style-block-Russia.html>

LPS gas explosion Izhevsk Russia 2017



<https://www.independent.co.uk/news/world/europe/russia-tower-block-collapse-gas-explosion-izhevsk-western-urals-victims-survivors-rescue-a8045911.html>

LPS Gas Explosion Magnitogorsk Russia January 2019



<https://www.dailysabah.com/europe/2019/01/03/death-toll-hits-39-in-russian-gas-explosion-as-rescue-operation-ends>

Gas Explosion Shakhty Russia January 2019



<https://www.nst.com.my/world/2019/01/450474/one-dead-four-missing-russia-gas-blast>

Consequences from Hackitt

- Changes to Building Regulations – initially structure and fire
- Safety cases for HRRBs
- Improvements in competency
- Change in culture
- Stronger penalties for non-compliance
- More safety reporting
- Digital records of everything

Consequences from Hansford

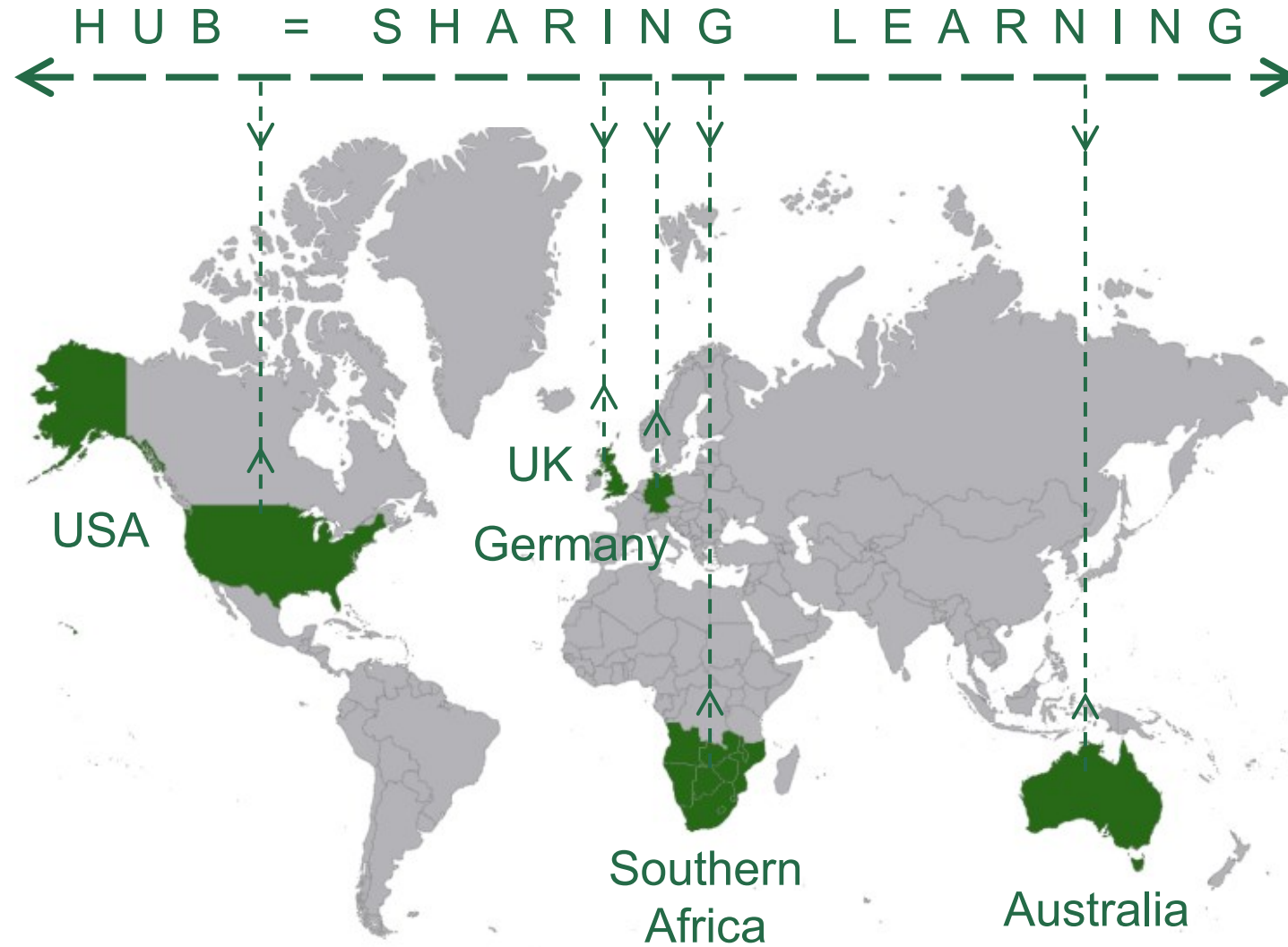
- Strongly promotes the Swiss Cheese Model
- Build on the work of Structural-Safety
- Highlight unaddressed infrastructure concerns, risks and near misses
- Work with Government to identify any new safety-critical asset classes requiring lifecycle statutory certification
- Set out the responsibilities of a competent infrastructure owner

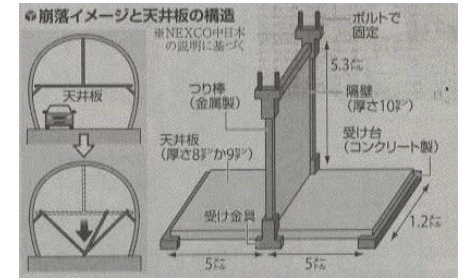
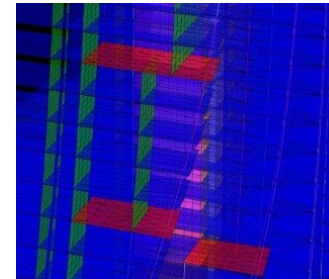
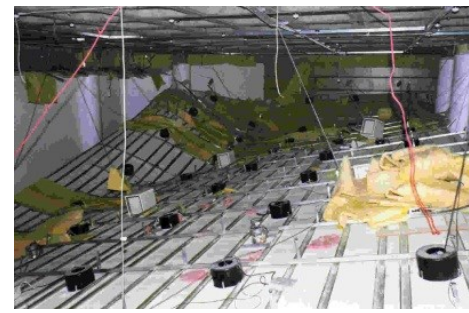


reflective thinking

- 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



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