The lessons learned so far from the Grenfell Tower fire and their potential impact on the construction industry.
Presenter – Martin Weller

- Fire safety engineer ~30 years’ experience in fire safety
- Formerly Head of Fire Engineering at London Underground
- Ran a fire testing laboratory
- Co-author of BS 9999: Code of practice for fire safety in the design, management and use of buildings;
- Author of CIBSE Guide E – the Application of risk assessment to fire engineering design
- Embedded in the MHCLG ‘Building Solutions’ Team in 2017
- Currently specialises in major infrastructure projects.
Content

1. Overview of the Grenfell Tower fire
2. Activity since – reports and inquiries
3. Description of legislation relevant to fire safety
4. Guidance available
5. Fire testing and product performance
6. Terminology
7. Design and construction ‘watch points’
8. Surveillance and verification, including record keeping

(Presentation includes drawings and text taken from the expert witness reports to the Grenfell Tower inquiry. Copies of these can be found here: https://www.grenfelltowerinquiry.org.uk/evidence)
Grenfell Tower

- 24 Storey tower block in Kensington
- Constructed in the early 1970s
- 63 m height to the top habitable storey
- 129 one and two-bedroom flats
- Single staircase, separated from flats by a lobby;
- Two lifts
- Smoke ventilation system to lobbies
- No communal fire alarm
- Subject to a number of refurbishments & alterations – most recent over-cladding in 2016
On the night of 14th June 2017…

- Fire started at around 0:50 hrs (BST) in Flat 16 on the 4th floor
- First call to fire brigade at 0:54 – 4 pumps sent to the fire
- First crews arrive at approx. 01:00
- First fire-fighters enter flat 16 at 01:07
- Fire had reached the cladding by 01:09
- Major incident called at 02:06
- Decision taken to evacuate all occupants at 02:47
- Entire external envelope aflame at 02:51
Consequences

- 70 people died in the building
- Two more deaths recorded as a direct consequence (including a stillborn baby)
Location of flat of fire origin
What happened

What we know…

• Refurbishment used Reynobond PE (Polyethylene cored) Aluminium Composite Material (ACM);
• Insulation was improved using a combination of Polystyrene (PS) and Polyisocyanurate (PIR) insulation – the vast majority being PIR
• There were no cavity barriers around window openings
• Other cavity barriers were present, but many were incorrectly fitted
• Combination of PE cored ACM, combustible insulation and extensive undivided cavities led to rapid fire spread, breaching compartment lines.
What we know

- Absence of functioning door closers on many fire doors
- Smoke control system did not work as it should have (though it would have been incapable of dealing with smoke in multiple lobbies)
- ‘Fire lift’ did not work
Cladding system applied
Cavity barriers – where should they have been?

Diagram 33: Provisions for cavity barriers
Cavity barriers – where should they have been?
Cavity barriers omitted …

Cavity barriers were installed in other locations, but many were incorrectly fitted…
What happened

What we *don’t* know…

• How it came to be that this material was used on the building (and on so many more)
• Who was to blame?
• That sprinklers would have prevented this tragedy.
The materials …

Reynobond PE

Exposed PE along flat cut edges
Exposed PE along re-entrant corner
Exposed PE along bevelled edge
Aluminium skins (interior surface)

Reynobond PE
Rainscreen Cassettes & Architectural Panelling

Polyethylene (PE)
Aluminium skin (outer surface)
Aluminium skin (inner surface)
The materials...

Polyisocyanurate (PIR) Foam Insulation (on Column Sections)
The materials...

Window infill panels

- PS foam insulation core
- Aluminium sheet
- Aluminium sheet
Scope of refurbishment

Internal works

Lobbies: Smoke control, heating/hot water and cold water, lobby redecoration.
Flats: New window reveal linings, heating/hot water & cold water.

9 new residential dwellings & Nursery, Boxing club, community rooms.
Heating/hot water & cold water.
Lobby redecoration.
Alterations to lift access.
Alterations to dry riser.
Extension of smoke control.
New entrance lobby.
New door entry system.

External cladding works

L3 - 23
Horizontal Reynobond 55 PE
Vertical Reynobond 55 PE

L1-2
Horizontal CGL Wallplank
Vertical Reynobond 55 PE

Glass reinforced Concrete Columns,
Glazed walls.
The installation… original

Vertical Section
Through Kitchen Window*

* Indicative sketch – not to scale
The installation… after refurbishment

Vertical Section
Through Kitchen Window*

* Indicative sketch – not to scale
The installation… after refurbishment

Horizontal Section
Next to Kitchen Window*

* Indicative sketch – not to scale
Compliant location for cavity barrier

Horizontal Section
Next to Kitchen Window*

* Indicative sketch – not to scale
The installation... after refurbishment

Horizontal Section
Next to Kitchen Window*

* Indicative sketch – not to scale
### Overview

**Independent Expert Advisory Panel**
- Sir Ken Knight, Ann Bentley – Rider
- Levett Bucknall, Roy Wilsher – NFCC
  - Advise on immediate safety action in high rise buildings following Grenfell fire
  - Immediate fire safety mitigation advice
  - Testing of cladding systems
  - Advise to building owners and government

**Industry Response Group**
  - Advise on possible solutions to ensure homes, offices and public buildings are safe
  - Advise on better ways of building and methods of construction
  - Coordinate government industry communications
  - Advise government on capacity and capability of supply chains
  - A member of the Expert Panel attends each meeting

**Review of Building Regulations & Fire Safety**
- Dame Judith Hackitt
  - Assessing the effectiveness of current building and fire safety regulations with a specific focus on multi occupancy high rise residential buildings
  - Ensuring the regulatory system is sufficiently robust for the further and make recommendations

### Coroner’s Inquest
- Dr Fiona Wilcox
  - Who died and how?

### Grenfell Tower Met Police Investigation
- Commander Stuart Cundy
  - What happened, has anybody broken the law?

### Grenfell Tower Inquiry
- Sir Martin Moore-Bick
  - How did this incident happen and can we stop it happening again?
Inquiry status as of December 2018

Grenfell Tower Met Police Investigation
- Met police
- On-going

Sir Martin Moore-Bick’s Inquiry
- Hearing Evidence
- Phase 1 nearly complete
- Preliminary Report due imminently

Dame Judith Hackitt’s inquiry:
- Interim report issued Dec 2017
- Final report issued May 2018
- (English) Government have accepted all recommendations and have issued an ‘implementation plan’
- ‘Ban’ on combustible materials in the external walls of HRRBs (including ‘institutional’ in England)

Review of Building Regulations & Fire Safety
Fire doors – advice from Expert Panel

- On 15 March, the Housing Secretary announced that the police identified an issue with a fire door installed at Grenfell Tower. The door was designed to resist fire for 30 minutes but lasted for approximately 15 minutes during the test, a much shorter period than expected.

- A wide-ranging investigation was established.

- The Secretary of State informed parliament on 16 May that based on the results of investigations to date, we concluded that there is a performance issue with composite 30-minute fire doors manufactured by Manse Masterdor.

- The National Fire Chiefs’ Council have advised that the risk to public safety remains low.

- Customers of these doors have been written to directly asking them to review their building fire risk assessment taking into account this new information and consider how quickly these doors should be replaced. A number of councils have begun replacing their fire doors.

- MHCLG Building Solutions are continuing their investigation into the wider fire door market and will test fire doors from other manufacturers.
Legislation relevant to fire safety in construction works…

In design and construction:
- Building Regulations 2010 (in Scotland - The Building (Scotland) Regulations 2004)
- The Construction (Design and Management) Regulations 2015
- The Construction Products Regulations 2013

In use:
- (for residential buildings) The Housing Act 2004
Hackitt mapped it...
Hackitt interim report – main findings

• Current regulatory system for ensuring fire safety in high rise and complex buildings is weak and ineffective.
• Industry behaviour characterised as a “race to the bottom” with significant evidence of ‘gaming’ the system
• Guidance is prescriptive but siloed, confusing and inconsistent
• Design and change management is poor, both during construction, occupation and refurbishment
• Experts are not listened to
• Residents are not listened to and have no reliable means to recourse
• Problems connected to the culture of the construction industry, building management and the ineffectiveness of the regulators that oversee
• Product testing, marketing, labelling and approval processes are flawed and unreliable
Hackitt report – main recommendations

• High-risk residential buildings (HRRBs) are defined as being 10 storeys and higher, rather than 18m.

• A new regulatory system should be established for HRRBs, overseen by a single regulator – the Joint Competent Authority (JCA) – made up of Local Authority Building Control, fire and rescue authorities and the Health and Safety Executive.

• The Review also calls for many key recommendations to be extended to other multiple occupancy residential buildings covered by the Fire Safety Order, and some other institutional residential buildings where people sleep, including care homes.

• There should be clear duty holders responsible for the fire and structural safety of a HRRB throughout its lifetime. During design and construction, these duty holders are likely to be the commissioning client, the principal designer and the principal contractor. Once the building is occupied, the duty holder should be the building owner or superior landlord.
Final report – main recommendations

- A stronger and tougher regulatory regime
- Clear responsibilities to actively manage on-going safety during occupation
- Fundamental overhaul of guidance
- Industry to lead on strengthening competence of professionals and set out a credible proposal within a year
- Stronger testing, labelling and traceability of products used in construction which are critical to building safety
- Empowered residents
- Analysis and follow up of dangerous occurrences through confidential reporting and whistleblowing
Government responses (England) – Nov/Dec 2018

- Government has issued a ‘clear ban’ on the use of combustible materials in the external walls for certain high-rise buildings over 18 metres (blocks of flats, hospitals, residential care homes, dormitories in boarding schools and student accommodation) – enshrined in The Building (Amendment) Regulations 2018.

- Assessments in lieu of tests (also known as desktop studies) for external wall systems for all buildings in scope of the ‘ban’ will not be allowed under any circumstances;

- The amended guidance further restricts the use of assessments in lieu of tests in other areas, including how they are undertaken and by whom.
Design and construction

‘Watch points’
Design

- Is there a fire strategy for the works (not always required, but if it has been produced it should list the key fire safety technical requirements for the works)? If so, it should be followed.
- Are any specifications involving fire safety clear and unambiguous?
- Design changes (before or during construction) – have the designers approved or endorsed that these do not unacceptably affect fire safety?
- Have designs been completed before work starts (particularly for the fire protection system(s))? 
- Have designs been co-ordinated between design disciplines (especially between different building services)?
Fire Strategy – what is it

• Not always required, if works are straightforwardly compliant with guidance, but sometimes clients will require one.
• Should be provided as a separate document for the more complex buildings. These will normally be authored by a Fire Safety Engineer.
• Describes how the design is fire safe, lists key system standards and technical requirements. Acts as a reference source for the design.
• Even if not provided (typical on the smaller jobs), there should still be drawings showing the key fire protection requirements for the design – e.g. fire resisting walls and floors, ratings, means of escape etc. These can be Architect-produced, or may be used by a fire safety engineer.
Role of the Fire Safety Engineer

- Defines the fire safety technical requirements for the design
- Defines the fire protection system standards to be used
- Decides what guidance is appropriate (AD-B, BS 9999, BS 9991, BB100, HTMs etc)
- Assesses the design for compliance with the above
- Justifies variations
- Marks up architectural drawings with fire resistance ratings (walls, doors, floors etc)
- Authors Fire Safety Strategy document (if required)
- Not always needed, if Architect has the relevant competence, but usually required on complex projects or where designs don’t meet the guidance
- Can help to avoid over-specification, and to aid Building Control approval
- Can assist in the preparation of Regulation 38 hand-over information
Product selection

• Products should meet the fire safety performance specifications, and the relevant standards

• Products with a fire safety-related function (or performance) should not be substituted without endorsement from an appropriately competent person (e.g. the project fire safety engineer, if it has one)

• Product fire performance should be verified by means of third-party produced documentation (manufacturers’ technical literature is not always reliable). If the documentation does not support the ‘end use’ application of the product, then it should not be used

• The Building Control Bodies are likely to be increasingly vigilant on the above, especially in high-rise developments
‘Value engineering’

- Criticised by Hackitt
- Nothing wrong with it, if properly conducted (personal opinion)!
- **Should involve the original design organisation(s)**
- Proposals to be taken forwards should be treated as design changes, and endorsed by the designers of all affected works
- Variation in fire safety performance should be endorsed by fire safety specialists – especially product performance. Test laboratories can sometimes offer ‘assessments’ for installations not directly covered by existing evidence.
Completion and hand-over (Regulation 38)

For simple buildings the guidance recommends that only basic information is required. This information could take the form of a detailed “as-built” plan of the building showing locations of the fire safety precautions in place, such as:

- Means of Escape & Signage
- Compartmentation & Fire Doors
- Automatic Fire Detection & Emergency Lighting
- Fire Service Provisions & Fire Fighting Equipment
- Sprinklers & Smoke Control Systems
- Hazard Areas

Any assumptions relating to the maintenance and management of the fire safety precautions should also be identified.

Relevant ‘O&M’ manuals should also be provided.

Copies of test and classification reports and CE Marking DoPs should also be handed over.
Summary
The Grenfell Tower tragedy…

- Has been described as a ‘seminal moment’ in the construction industry.
- Whilst only the Hackitt enquiry has concluded (and Government is yet to respond in detail to its recommendations), the ‘Industry’ is already moving to put its house in order.
- The effects are likely to spread far beyond fire safety, and beyond the confines of Grenfell-type residential buildings;
- There will be greater demands on participants in the design and construction process to demonstrate their competence.
- CSCS is likely to be tightened up and extended (according to Build UK).
Insurance costs are rising (not just because of Grenfell)...

Contractors braced for huge hikes in insurance premiums

Insurers begin to bump up premiums by more than 50% or even decline cover in wake of Grenfell fire

By Hannah Charnay

Contractors are being warned to expect big hikes in insurance premiums in the wake of the Grenfell fire and additional scrutiny following publication of the forthcoming Hackitt review.

The boss of one tier-one contractor told Building his firm is facing a large increase in its professional indemnity (PI) premium as insurers become increasingly worried about the risk associated with contracting "and anything to do with cladding".

And while a majority of firms surveyed earlier this year by Build UK and the Construction Industry Council (CIC) said they had not yet seen their PI premiums rise, 10% said they had increased by more than 30% or had been refused altogether.

CIC chief executive Graham Watts said companies are likely to face a grilling from insurance firms when their policies come in for renewal in the coming months.

“Construction companies are going to be asked more and tougher questions from now on, as the risk is perceived to be greater. Insurers will tighten the conditions under which they will offer cover, or even withdraw it altogether.”

Watts said there is about £2bn-worth of remedial work to be done on anywhere between 300 and 600 high-rise residential towers in the UK following Grenfell, and that there are concerns around the industry's capacity to cope if companies walk away because of unaffordable insurance.

Pressure to bump up premiums could increase further following publication of the Hackitt report into building regulations and fire safety, due later this month.

Greg Harrison of insurance broker Howden acknowledged that a number of insurers are scaling back their exposure on accounts that are heavily involved in the design, specification or installation of cladding and said firms "should be prepared to carry out a thorough review of all projects involving buildings with cladding undertaken in the past 12 years as soon as possible."

“In some cases we are seeing insurers restricting cover or at worst, declining to renew. However, as long as the right questions are asked and firms can demonstrate that they have undertaken a thorough review of their cladding contracts and found limited exposure, then we would expect renewal terms to be reasonable and any restriction in cover, if any, to be limited."

But many firms would find such a review process to be an administrat nightmare, with the client ultimate paying for it, according to the tier-one contracting boss.

“The amount of investigation required is very time-consuming and the bureaucracy involved is overwhelming. We will simply pass the cost onto our clients,” he said.
Continued…

• Regulatory oversight will increase (this has already started), and they will be more ‘risk averse’
• Penalties for breaches of regulations are likely to be significantly increased
• Building legislation will change, as will the accompanying guidance
• BIM will be a key tool & it’s use will become more widespread, including after construction (during management and maintenance)
Questions...?

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