Building Control Northern Ireland

Fire Safety Panel

25th ANNUAL FIRE SAFETY CONFERENCE

23 & 24 February 2023

Armagh City Hotel

"The changing face of fire safety"

Marking 50 years of the Building Regulations in Northern Ireland

BCNI, Fire Safety Panel

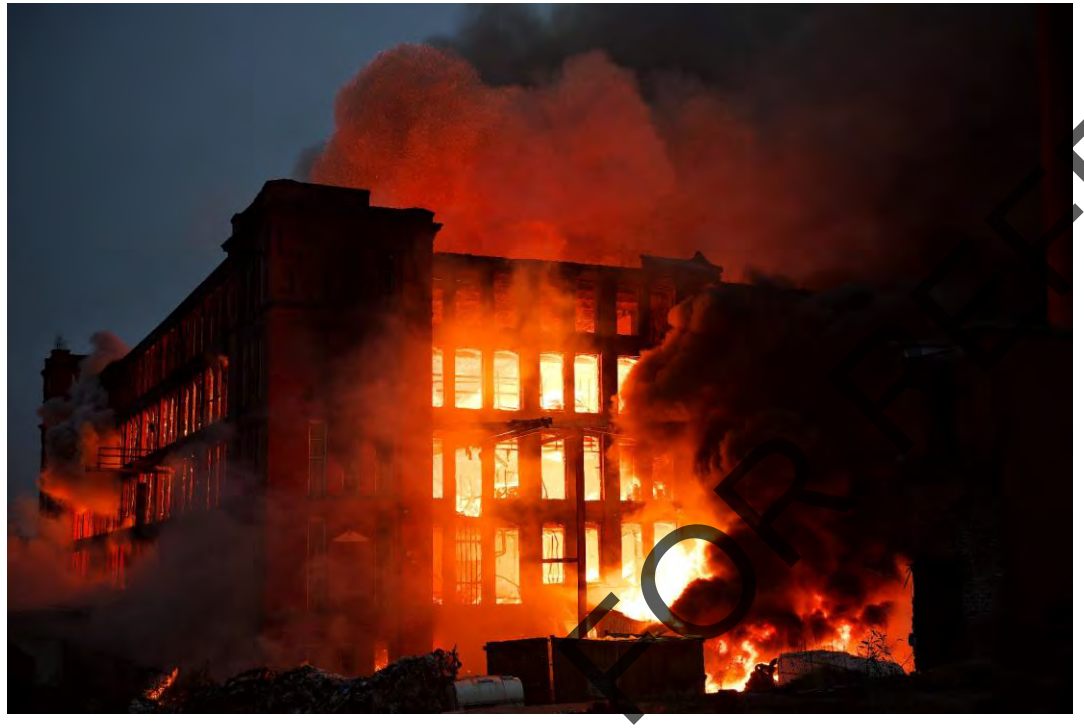
The Evolution of Regulation: Lessons and Opportunities for Construction

Merlyn Forrer MEng (Hons) CEng FIFireE MSFPE

Senior Associate

merl@designfireconsultants.co.uk

17th Feb 2023



Fire Update

Content

- A bit of fire history (again)
- The Building Act and regulator
- Changing regulations and guidance
- Certainty in construction
- Cumulative updates to guidance
- Competency and ‘pseudo’ experts

Audience participation

Hands in the air…

- How many have stayed in a hotel (or student accommodation) – arms up
- How many have stayed in a hotel when the fire alarm has sounded – keep arms up
- Who left immediately – without delay (truthfully and every time) – arms down
- How many have stayed and waited to see ‘if it’s a real alarm’ for a couple of minutes? – keep arms up
- How many waited for a few minutes and decided to get dressed and leave? – arms down
- How many didn’t leave?

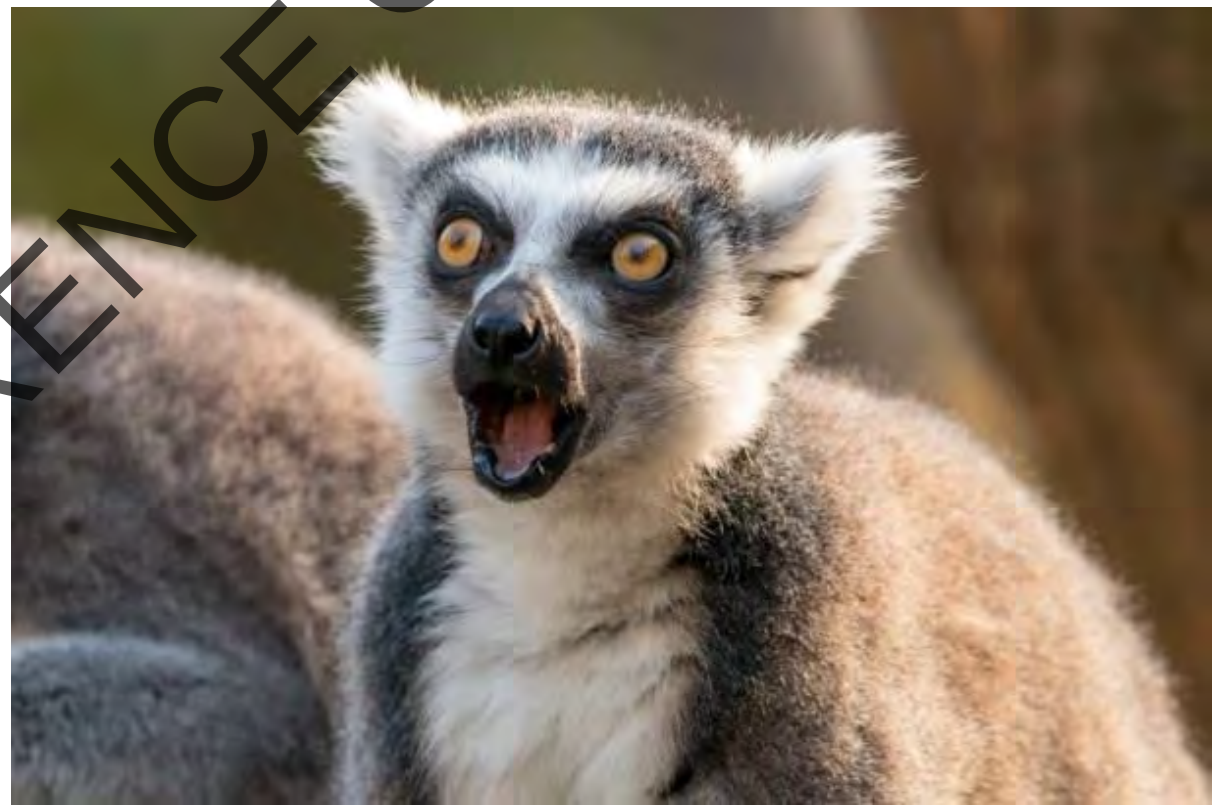
A bit of fire history

1135	Great Fire of London (1212)	– Non-combustible roofs
1666	Great Fire of London	– Conflagration
1840	The Health of Towns Report	– Health controls in building regulations
1861	Tooley Street, London	– Compartment sizes
1911	Empire Palace Theatre	– Escape times
1973	Summerland, Isle of Man	– Surface spread of flame
1974	Fairfield Old Persons' Home	– Cavity barriers
1979	Woolworths, Manchester	– Combustible furniture
1981	Stardust Disco, Dublin	– Management
1985	Bradford City Football Ground	– Occupant response
1987	Kings Cross Underground	– Combustibles underground
1992	Windsor Castle	– Fire action plan
1996	Channel Tunnel	– Management
2004	Rosepark care home, Glasgow	– Vulnerable occupants
2007	School fires leading to losses	– Sprinklers in BB100

The Building Act and Regulations

Part B – Society and Norms

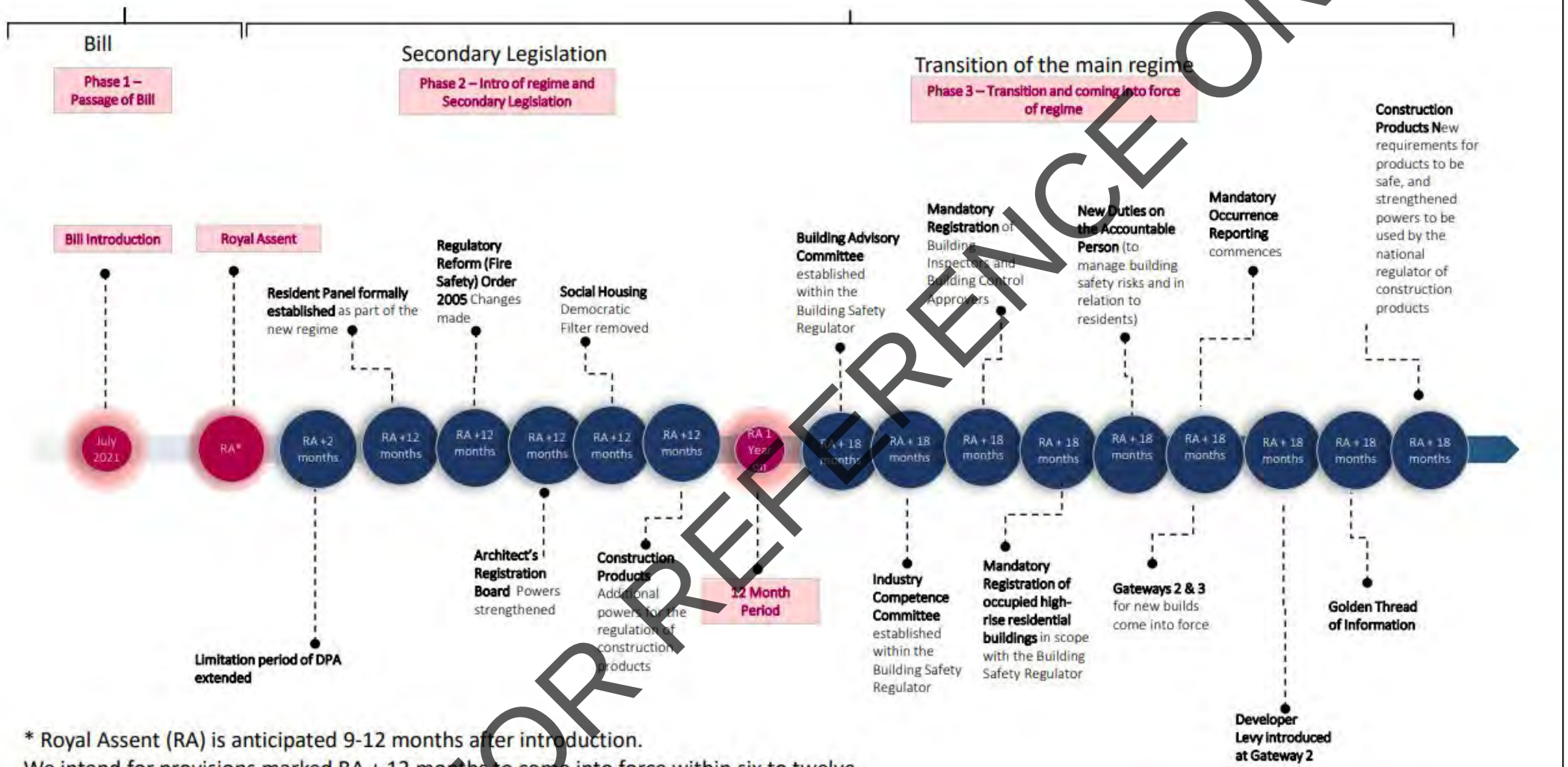
- Gov consultation 23rd Dec 2022, ‘we have identified the value for ‘wellbeing’ that would be required to achieve a neutral cost-benefit’.
- So where does ‘wellbeing’ / welfare sit?
- Regulation 4 of the Building Regulations requires that building works demonstrate compliance with Part B of Schedule 1 to the Building Regulations.
- Part B stipulates functional objectives with respect to fire safety (these are not quantified), and Regulation 8 requires that Part B can only require measures that are necessary to, “secure a reasonable standard of health and safety for those in and around the completed building.”
- There is no definition or quantification of, “reasonable”.



Introduction

- Upcoming Changes to Guidance
  - ADB Volume 1 and 2
  - BS9991 Draft
- Building Safety Act – Gateway 1
  - Town and Country Planning
  - Health and Safety Executive (HSE)
  - The London Plan
    - o Policy D5
    - o Policy D12
- Building Safety Act – Gateway 2
  - Residential Towers (>50m)
  - The QDR Process
- Building Safety Act – Gateway 3

Building Safety Bill



* Royal Assent (RA) is anticipated 9-12 months after introduction.
We intend for provisions marked RA + 12 months to come into force within six to twelve months of Royal Assent.
We intend for provisions marked RA + 18 months to come into force within twelve to eighteen months of Royal Assent.

Building Safety Bill & Transition

The Building Safety Act

The Building Safety Regulator

- HSE, BCO and Fire Officer
- Defines requirements for compliance
- Buildings registered with the Regulator
- Receives information as part of Gateway process
- Receives Safety Case Report
- Provides Building Completion Certificate
- **Expected to be operating at 12-18 months after Royal Assent**
- **UK Spec for HRB (Higher Risk Buildings)**

The Building Safety Act

Gateway 1 – planning – risks

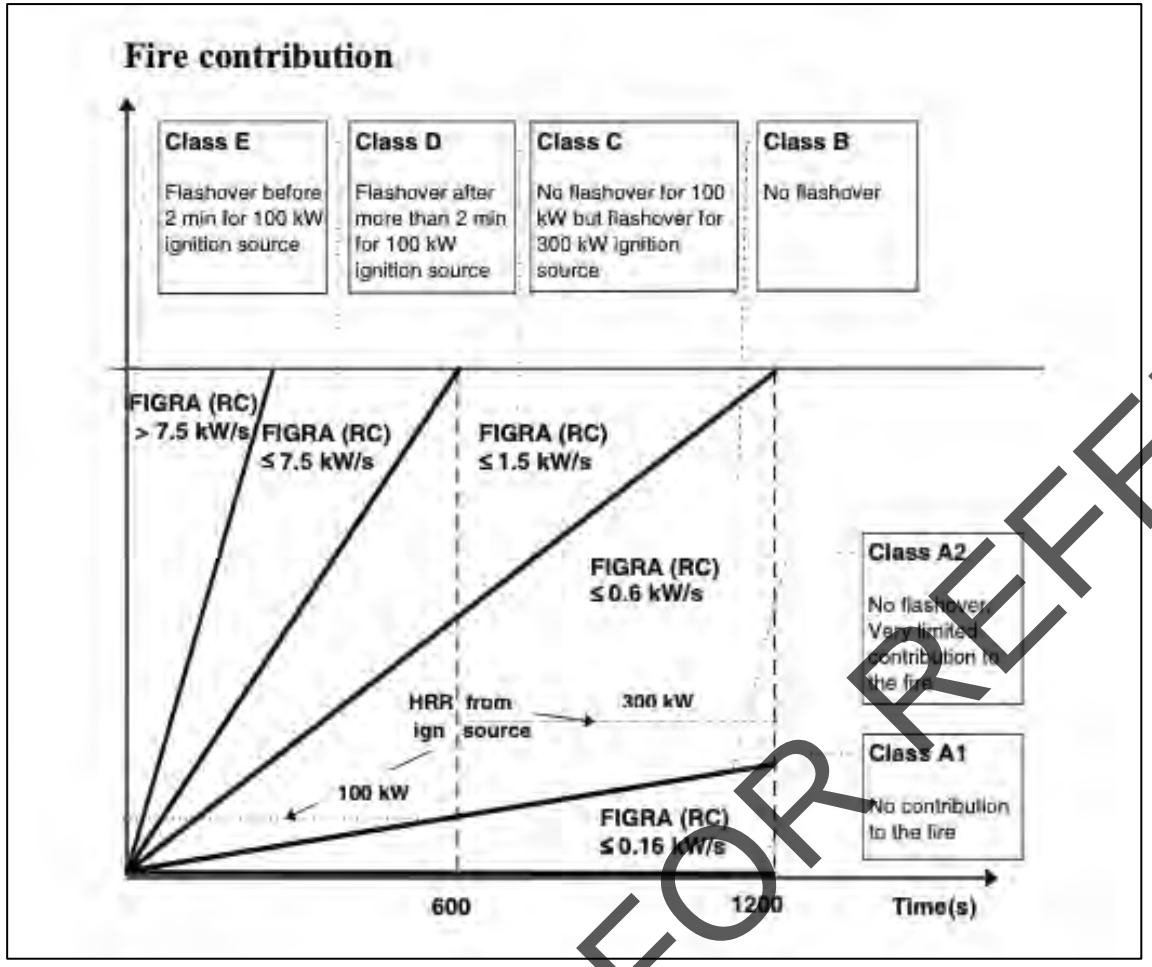
- HSE response; statutory consultee & regulator
  - Single stairs and ancillary spaces
  - Stairs to basement
  - Lifts to basement
  - “We have reached an impasse” “We recommend the application is refused”
- Fire service response
- Redesign; Gateway 1 vs. consultation times etc.
- Rules of engagement
- Lack of clarity in requirements
- The process is getting easier

Regulations and Guidance

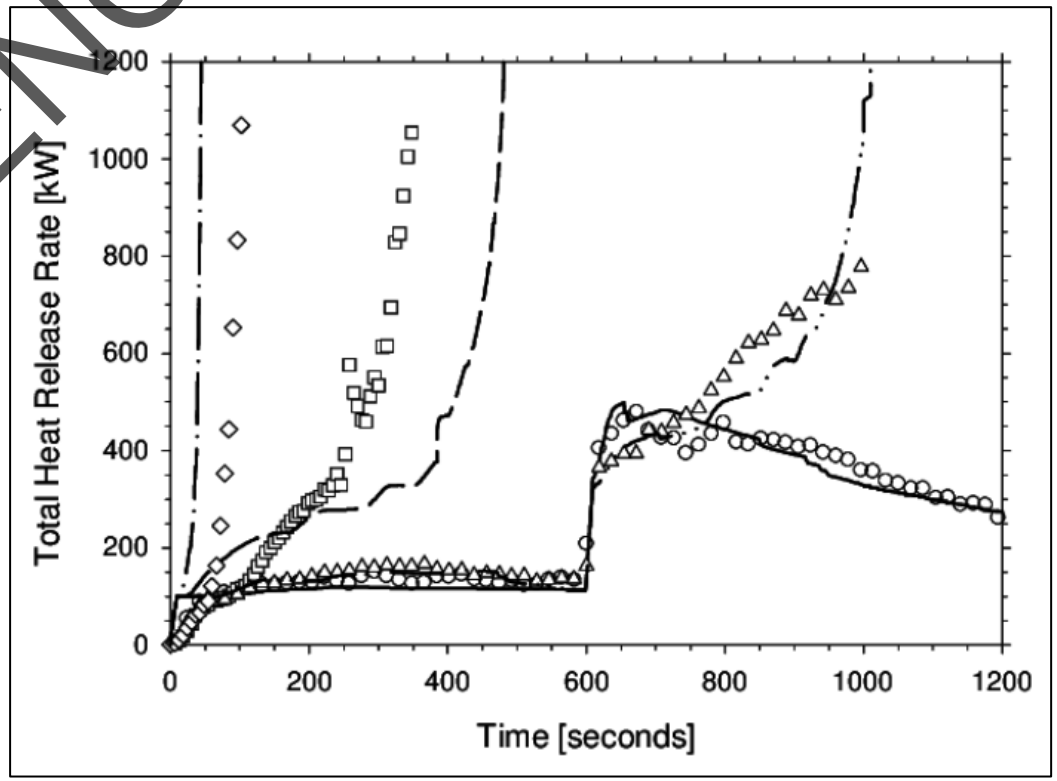
New Materials and Buildings

Fiction	Fact
• Combustible materials are unsafe	• Some combustible materials are unsafe
• Non-combustible materials are safe	• Non-combustible materials are probably safe
• Failing BS 8414 test = unsafe	• Depends
• Cat 2 ACM & combustible insulation is unsafe	• Can be safe if adequately detailed
• Stay-put is unsafe	• Stay-put should be safe
• Single stair is unsafe	• Single stair can be safe

Euro Classification



- https://www.sciencedirect.com/science/article/pii/S0379711222001898?via%3Dihub (Dr. A Law, Dr. G Spinardi, Prof. L Bisby).



BS 9991 Draft Changes

Key Changes - complexities

- Unprecedented number of responses
- Currently under review
- More stringent conditions for single stair
- Evac lifts and lobby
- Smoke ventilation conflicts
  - Protection to stair
  - Protection to evacuation lift
  - Extended corridor
- Secondary power supply

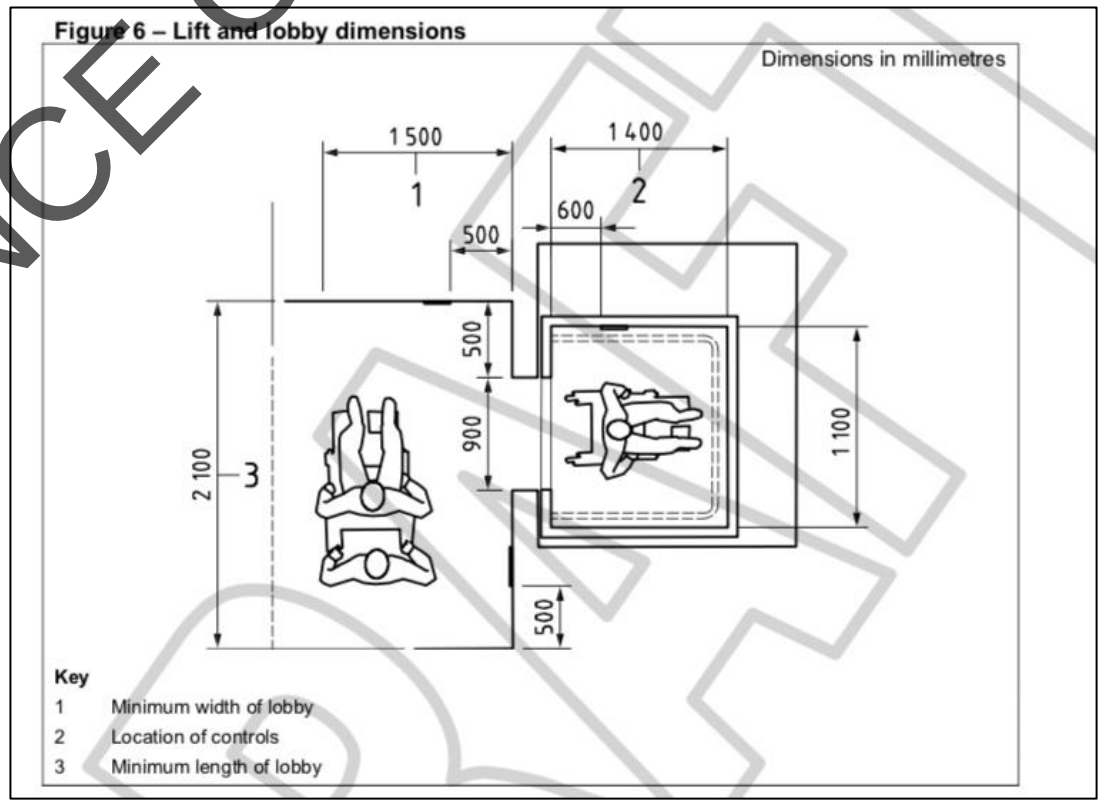
The Impact of a Second Stair

- ~£20k per flight
- £450 - £600m^2
- 1 building at 26 storey (1), 2 buildings at 11 storey (3 and 4), 2 buildings at 15 storey (2 and 5).
- Additional core size ~23m^2
- Second stair cost
  - Building 1 ~ £520,000
  - Building 2 and 5 ~ £300,000
  - Building 3 and 4 ~ £220,000
- Floor area cost
  - Building 1 ~ £257,000 - £343,000
  - Building 2 and 5 ~ £148,000 - £198,000
  - Building 3 and 4 ~ £108,900 - £145,200
- Total additional cost ~ £2,332,000.00 - £2,589,600.00

What is Happening

Changing guidance

- How does two stairs make the building safer?
- Should it be three? Redundancy?
- How does a second stair make it safer for mobility impairment?
- What about evacuation lifts?
- Does this provide means of escape for all?



CP3 ‘Precautions against fire’ flats and maisonettes

Defend in place

Also, the assumption should no longer be made that entire buildings, whole floors, or even adjoining dwellings need to be evacuated if a fire occurs. Owing to the high degree of compartmentation provided in dwellings in modern blocks, the spread of fire and smoke from one dwelling to another and the need to evacuate the occupants of adjoining dwellings are unusual. The occupants should be safe if they remain where they are. Nevertheless, the possibility that individuals may seek to leave the building cannot be overlooked and provision should therefore be made for the occupant of any dwelling to do so by his own unaided efforts, using adequately protected escape routes within the building without outside assistance.

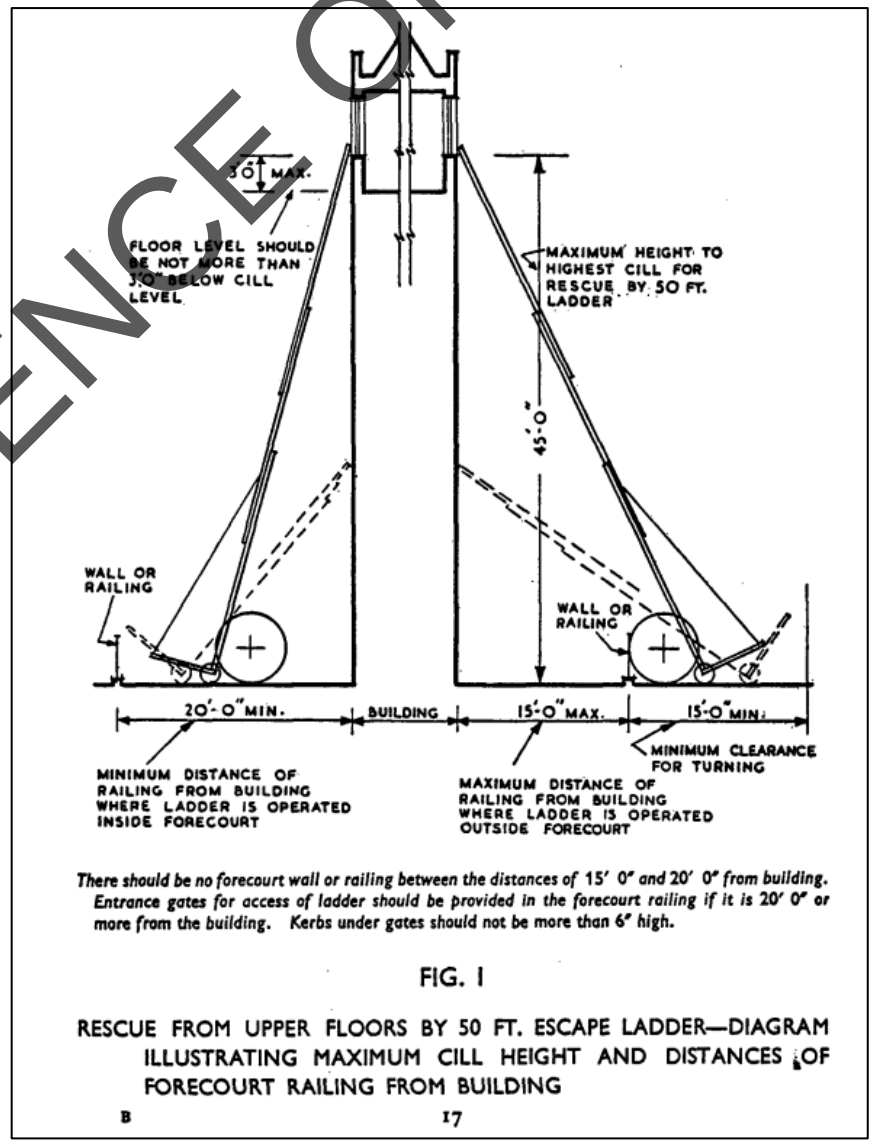
Prescriptive Design

Historical Interpretation

- What is the basis of the 20m reversing?
- CP3 1962 – […] *should be provided and so sited as to enable the appliance to be brought to a reserved position within 60ft of and in site of the inlets to any rising main*
- *Horses cannot walk a carriage backwards because the harnessing only allow them to push back with their haunches.*
- *The carriage would be pushed backwards, whilst the horse was 'walked' backwards to keep the cart of the horse's hind quarters.*
- Would it be beneficial to have a wider road so fire appliances can pass each other, when fire appliances are engaged in firefighting operations?
- Adopting prescription does not negate the obligation to consider fire safety as a design constraint and provide good design solutions to achieve fire safety goals and mitigate fire risk.

Prescriptive Design

- Should we as building designers be thinking in terms of prescription or performance based fire engineering?
- Surely, we need starting thinking more about good fire safety design, regardless of the method we use to evaluate that design.
- Should we not assess every building separately, taking into consideration the specific design objectives and client requirements and the specific fire hazards and consequences?
- Only when doing this can we create quality solutions that comply with all fire safety goals
- 11, 18, 30m, 50m – magic numbers or restrictions



There should be no forecourt wall or railing between the distances of 15' 0" and 20' 0" from building. Entrance gates for access of ladder should be provided in the forecourt railing if it is 20' 0" or more from the building. Kerbs under gates should not be more than 6" high.

FIG. 1

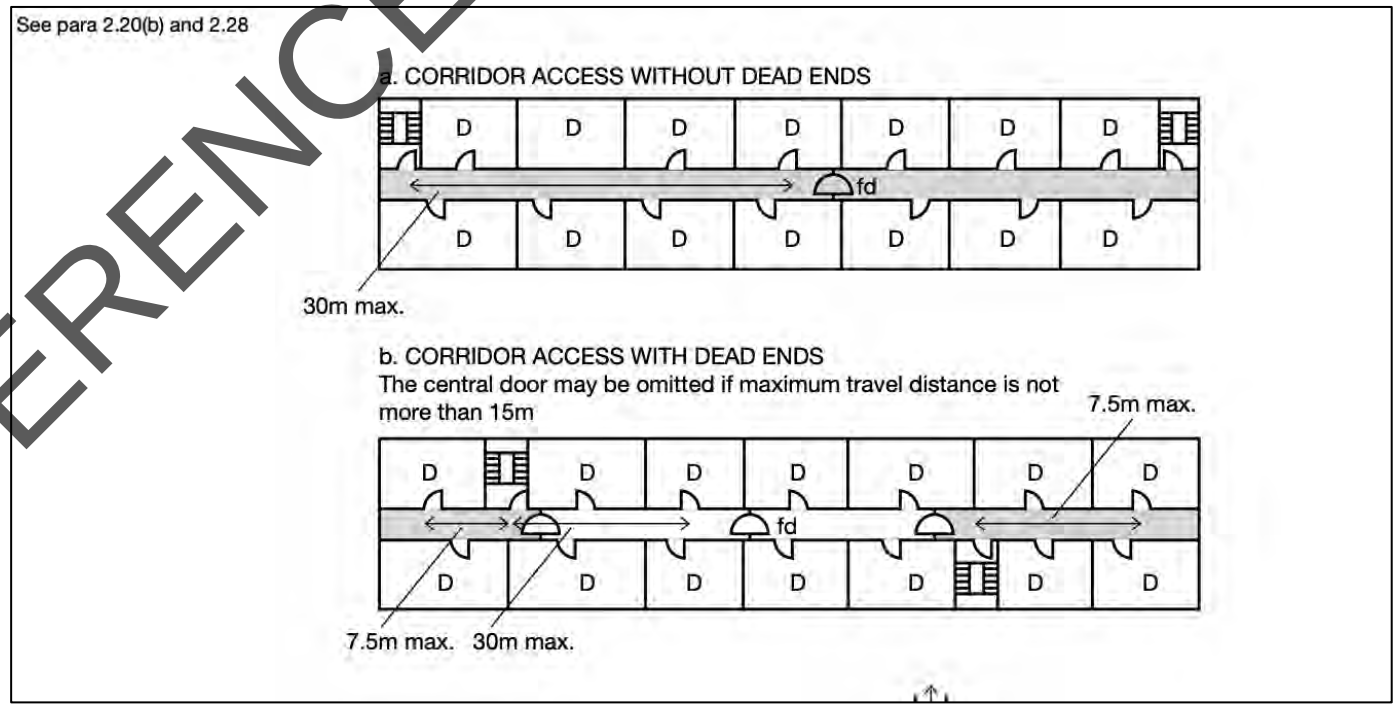
RESCUE FROM UPPER FLOORS BY 50 FT. ESCAPE LADDER—DIAGRAM ILLUSTRATING MAXIMUM CILL HEIGHT AND DISTANCES OF FORECOURT RAILING FROM BUILDING

B 17

Two stairs better than one?

- Let's consider previous guidance (ADB:2006)
- Two staircases inset by up to 7.5m (b) ventilated to protect the stair.
- 60m corridor between the stairs unventilated.
- No sprinklers up to 30m building height (resi).

- Single stair building >7.5 single direction of travel
  - Automatic fire suppression.
  - Mechanical ventilation.
  - Life safety generator or 'diverse routeing'
  - Extended travel distance (>15m) = CFD modelling to demonstrate the mechanical smoke control system protects the corridor for means of escape and the staircase enclosure for means of escape and firefighting.



Single stair buildings

Travel distance >7.5m

11.2 Permitted variations

With the exception of accommodation provided for occupants who are not capable of independent evacuation from their flat (see **11.1**), where a block of flats is fitted with a sprinkler system in accordance with BS 9251:2014 or BS EN 12845 (see Table 2), the maximum travel distance for escape in the ventilated section of common corridors in one direction only may be increased from 7.5 m to 15 m, and for escape in more than one direction it may be increased from 30 m to 60 m.

However, it should be noted that the validity of this assumption is the subject of some considerable debate in fire engineering circles and may be potentially open to some criticism. From the agreed value, it is assumed that no further items of fuel ignite, and the value of mass flow in the plume is calculated accordingly. After operation, it may be assumed that the sprinklers cool most of the smoke layer to a temperature less than the operating temperature of the sprinklers. For calculation purposes, an average smoke layer temperature of 100 °C may be assumed with conventional sprinkler heads, while the sprinklers are operating.

Table 5.1 Illustrative fire fighter tenability conditions

Tabel 5.1 Illustrative fire fighter tenability conditions

Exposure Condition	Maximum exposure time (minutes)	Maximum air temperature (°C)**	Maximum radiated heat flux (kW/m²)	Remarks	Recommended distance from apartment door*
Routine	25	100	1	General fire-fighting	15-30m
Hazardous	10	120	3	Short exposure with thermal radiation	4-15m
Extreme	1	160	4-4.5	For example, snatch rescue scenario	2-4m
Critical	<1	>285	>10	Considered life threatening	0-2m

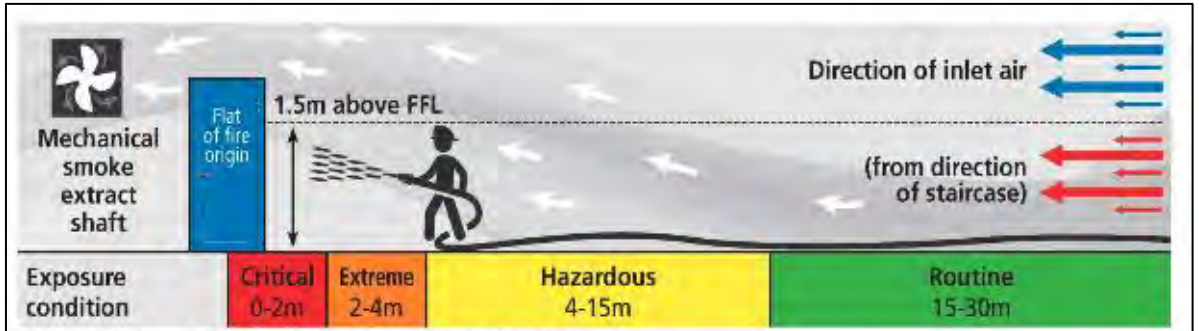
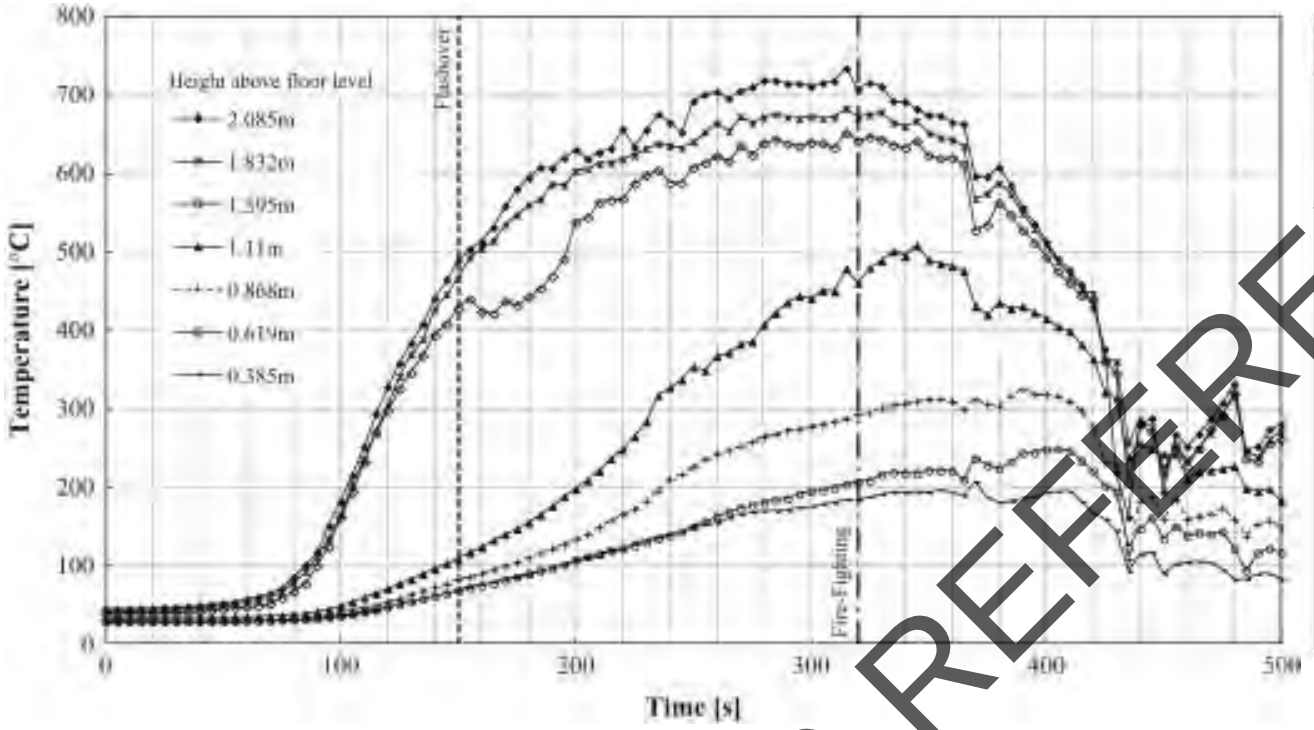
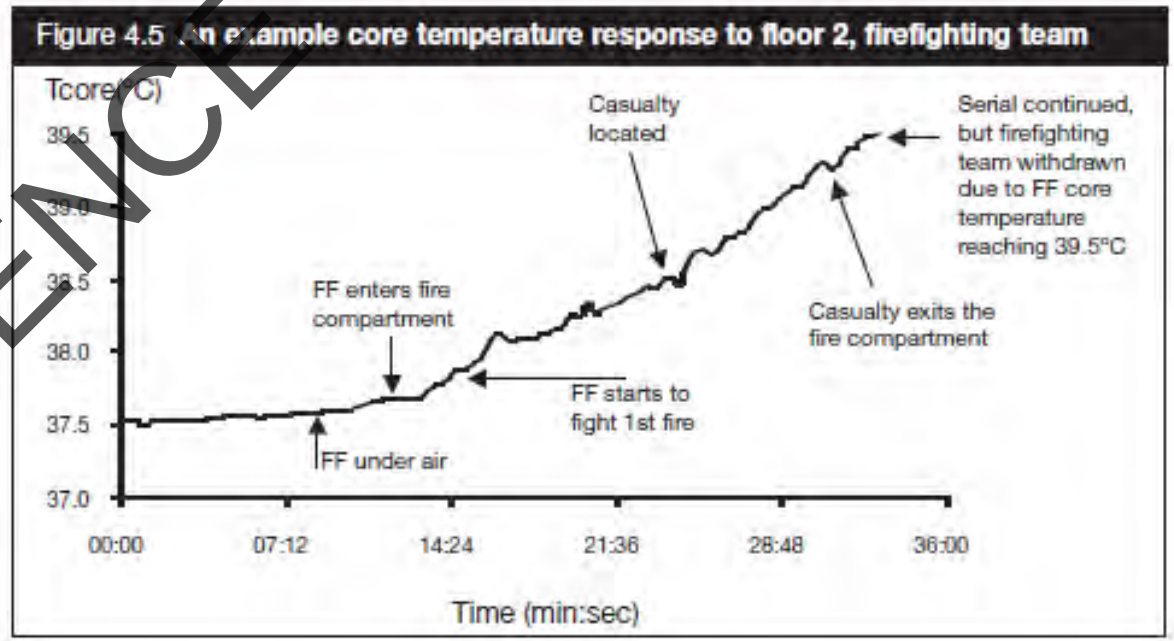


Figure 5.1 Fire fighter tenability conditions

Physiological Assessment of Firefighting, Search and Rescue in the Built Environment – Report 2/2005





- A horizontal distance of 34m into the fire compartment seems to be the maximum distance

https://www.ukfrs.com/sites/default/files/2017-09/Techincal%20Report%202_2005%20-%20Physiological%20Assessment%20of%20Firefighting_%20%20Search%20and%20Rescue%20in%20the%20Built%20Environment.pdf

Updates to guidance

	>11m	>18m	>30m	>50m
BS 9251	30 min duration >72 / >100m^2 = BS 12845[Note 1]	60 min duration, duplicate pumps/ power supplies, possible split tanks, >72 / >100m^2 = BS 12845[Note 1]		
BS 8519	Diverse routes not available – generator of UPS			
BS 7671	Only cables associated with life safety systems, general lighting and sockets for cleaning and maintenance in protected escape routes			
London Plan	Evacuation lifts with all staircases	Evacuation lift must be separate from FF lift	Two stairs	
BS 9991	Protected and vented lobby for lift. Separate corridor to access apartments [Note 3, 4] Sprinklers to cover common corridors and stairs	Second evacuation lift[Note 2] possible second FF lift. Two stairs unless pressurisation […]		
BS 8629	N/a	Emergency alert system required		
BSR	N/a	Single stairs cannot be connected to basement or ancillary. Distance from FF main should not exceed 34m[Note 6]	>900m^2 must have 2 FF shafts[Note 5] QDR required (buildings over 50m) as prescriptive guidance may not be sufficient.	
Reg 7 (2)	Possibility of extension of Reg 7 (2)	Materials A2-s1, d0 or A1 – laminated glass issue		
ADB Changes	Premises information boxes	Two stairs		
Other	What about EV's and other fuel types (Part S), Greener buildings, timber frame (STA), green walls […] Little or no change in guidance to residential dwelling houses.			

Notes
1 What about insurer requirements to BS EN 12845 which are not required to BS 9251
2 For risk of maintenance
3 Which will include a separate ventilation system is distance of over 4.5m
4 Text states the lobby must be protected to the same standard as the stair, which implies ventilation to adjacent corridors.
5 Irrespective whether the FRS is satisfied.
6 Measured from the FF shaft.

Basis of Design and Regulation

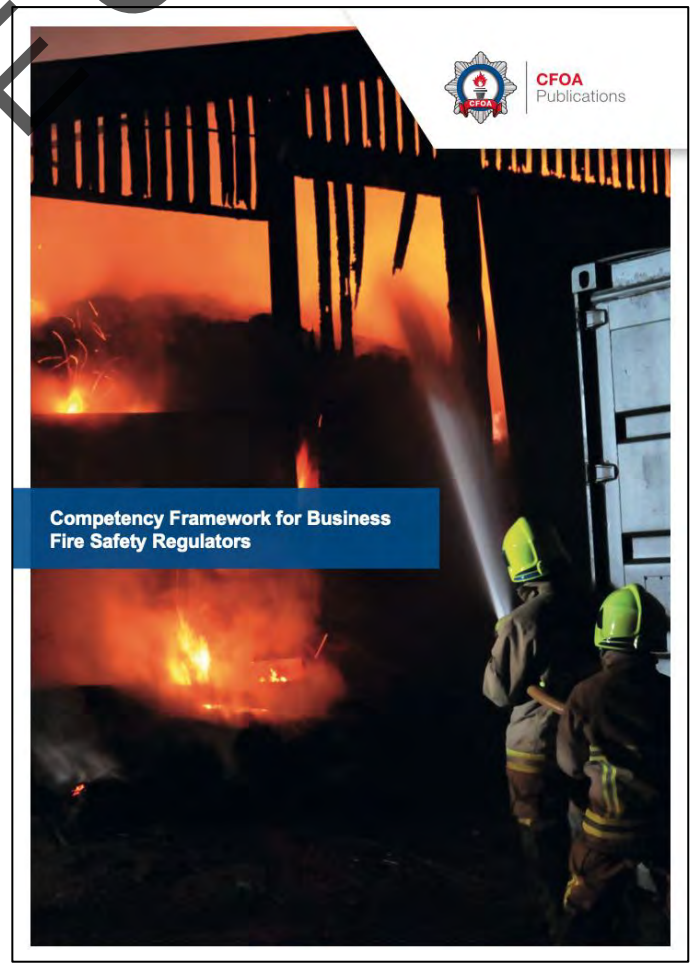
- The fire safety strategy for the building should not use a mixture of differing publications, i.e. the design team should not pick and choose the best bits.
- The design should meet an adequate standard.
- This is also true for the authority having jurisdiction and regulators.

If other codes or guides are adopted, the relevant recommendations concerning fire safety in the particular publication should be followed, rather than a mixture of the publication and provisions in the relevant sections of this Approved Document. However, there may be circumstances where it is necessary to use one publication to supplement another.

Competency Frameworks

Expertise

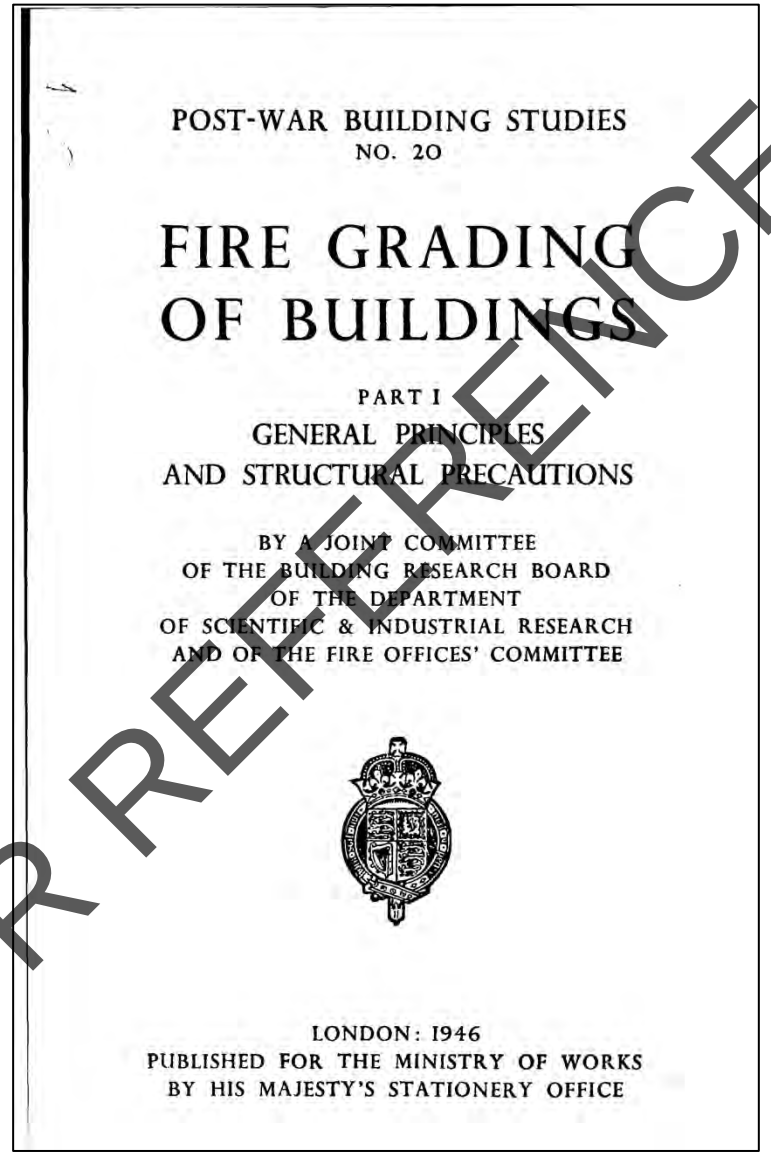
- Developed in 2013, updated 2020 to ensure a common and consistent approach to supporting businesses and to reduce regulatory burdens
  - Fire Safety Advisor
  - Fire Safety Risk Assessor
  - Fire Safety Inspector
- Why is engineer not a protected title? (Canada, Chile, Turkey, Brazil) words matter…
- What should be the minimum standard to be called a ‘fire engineer’?
  - Anyone can call themselves a ’fire engineer’
  - Should there be minimum academic qualifications and registration?
- Is this having a detrimental impact on fire engineering with ‘pseudo’ experts?
- IEng / CEng (HRB)



Outcome Focus

Function vs Prescribed Answers

- Guidance is useful
- Prescribed answers can be useful
- Prescription is not the answer:
  - Really very difficult
  - Not all building situations
  - Not always safe
  - Detracts from science
  - Detracts from outcomes



POST-WAR BUILDING STUDIES
NO. 20

FIRE GRADING OF BUILDINGS

PART I
GENERAL PRINCIPLES AND STRUCTURAL PRECAUTIONS

BY A JOINT COMMITTEE
OF THE BUILDING RESEARCH BOARD
OF THE DEPARTMENT
OF SCIENTIFIC & INDUSTRIAL RESEARCH
AND OF THE FIRE OFFICES' COMMITTEE

LONDON: 1946
PUBLISHED FOR THE MINISTRY OF WORKS
BY HIS MAJESTY'S STATIONERY OFFICE

Table B4 Minimum periods of fire resistance

Purpose group of building	Minimum periods of fire resistance[1] (minutes) in a:						
	Basement storey* including floor over		Ground or upper storey				
	Depth (m) of the lowest basement		Height (m) of top floor above ground, in a building or separated part of a building				
	More than 10	Up to 10	Up to 5	Up to 11	Up to 18	Up to 30	More than 30
1. Residential:							
a. Block of flats							
– without sprinkler system	90 min	60 min	30 min†	60 min+§	Not permitted[2]	Not permitted[2]	Not permitted[2]
– with sprinkler system[3]	90 min	60 min	30 min†	60 min+§	60 min+§	90 min+	120 min+
b. and c. Dwellinghouse	Not applicable[4]	30 min†‡	30 min†	60 min[5]	60 min[5]	Not applicable[4]	Not applicable[4]
2. Residential							
a. Institutional	90 min	60 min	30 min†	60 min	60 min	90 min	120 min‡
b. Other residential	90 min	60 min	30 min†	60 min	60 min	90 min	120 min‡
3. Office:							
– without sprinkler system	90 min	60 min	30 min†	60 min	60 min	90 min	Not permitted[6]
– with sprinkler system[3]	60 min	60 min	30 min†	30 min†	30 min†	60 min	120 min‡
4. Shop and commercial:							
– without sprinkler system	90 min	60 min	60 min	60 min	60 min	90 min	Not permitted[6]
– with sprinkler system[3]	60 min	60 min	30 min†	60 min	60 min	60 min	120 min‡
5. Assembly and recreation:							
– without sprinkler system	90 min	60 min	60 min	60 min	60 min	90 min	Not permitted[6]
– with sprinkler system[3]	60 min	60 min	30 min†	60 min	60 min	60 min	120 min‡
6. Industrial:							
– without sprinkler system	120 min	90 min	60 min	90 min	90 min	120 min	Not permitted[6]
– with sprinkler system[3]	90 min	60 min	30 min†	60 min	60 min	90 min	120 min‡
7. Storage and other non-residential:							
a. any building or part not described elsewhere:							
– without sprinkler system	120 min	90 min	60 min	90 min	90 min	120 min	Not permitted[6]
– with sprinkler system[3]	90 min	60 min	30 min†	60 min	60 min	90 min	120 min‡

Why have we got it so wrong?

What are the REAL issues?

Perceived vs Real risks:

- Is the problem really Guidance/Regulations?
  - ***Or are they just a convenient scape goat?***
- Large, sweeping change to technical guidance are having a significant impact on the industry
  - Additional stairs
  - Sprinkler protection
  - Do two stairs make buildings safer? What about evacuation lifts?
  - What level of safety do the public expect?
- Planning Gateway 1 – it's a good thing, should it be extended?

Is there a better way to improve safety than a wholesale overhaul of Regulations and Guidance?

Thank you for listening