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# The Hackitt Report Influences on Building Design

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# Agenda

- Product combustibility classifications explained
- Fire legislation amendments and supplementary guidance
- Next steps
- Building design influences
- The Golden Thread

# Fire Safety in Buildings

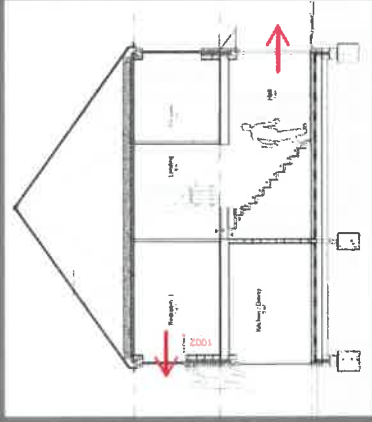
- Ensuring life safety should be a main consideration of building design.



- *When building designers make mistakes with fire – the consequences are fatal.*

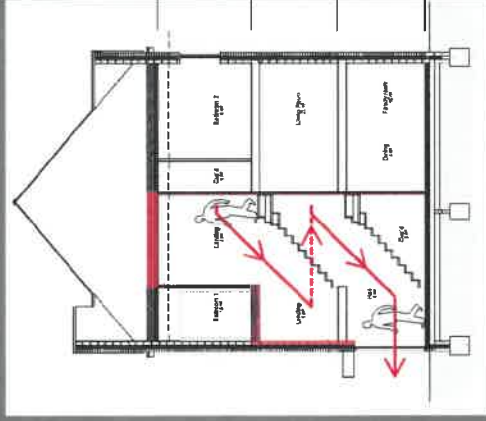
# Some Basics of Fire Regulation Compartmentation and Combustibility

- Different buildings require different measures of protection.



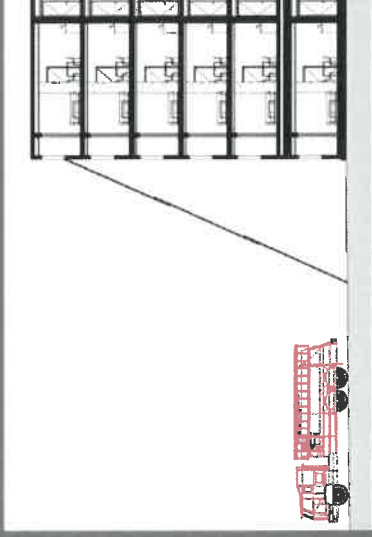
2 Storey House Example

Combustible Permitted



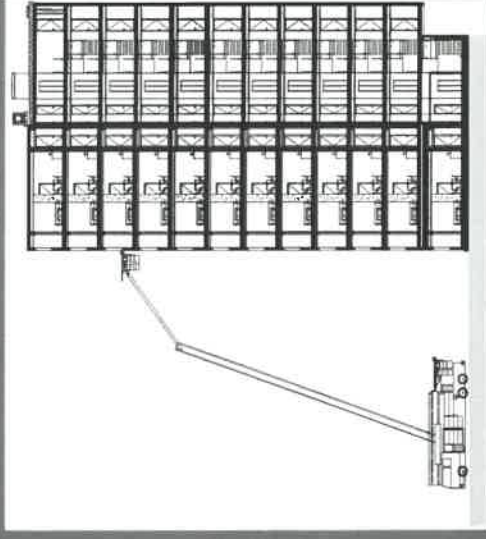
3 Storey House Example  
(or other uses)

Combustible Permitted



18 Metre Residential Buildings  
'Relevant Buildings'

Limited Combustibility  
A2-s1-d0



30 Metre Residential Buildings Example  
High Risk Residential Building (HRRBs)  
'Relevant Buildings'

Limited Combustibility  
A2-s1-d0

- Notice the requirement is still for Limited Combustibility and not Non-Combustible

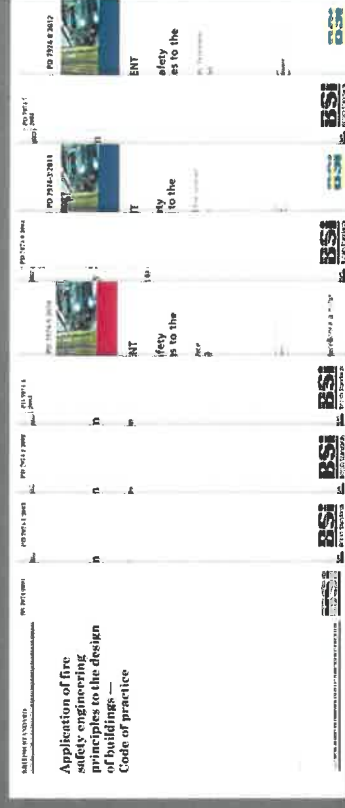
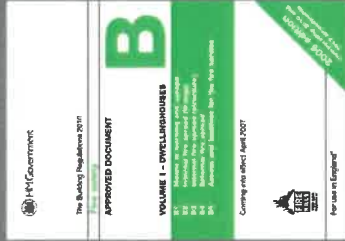
# Building Material Selection: Insulations

- Different insulation products, with different properties and advantages.

Insulation Material	Thermal Resistance Performance	Air Barrier (if sealed at joints)	Vapour Barrier	Combustible	Resistance to Moisture	Compressible Strength	Typical Cost / m2
Mineral Wool	Lower 0.041W/m2K	No	No	No	Low	Poor / None	Low / Medium
Natural Wool (Sheep's wool)	Lower 0.044W/m2K	No	No	Yes	No	None	Medium
EPS Expanded Polystyrene	Medium 0.034W/m2K	Yes	Medium	Yes	Yes	Very High	Medium / High
XPS Extruded Polystyrene	Medium 0.032W/m2K	Yes	Medium	Yes	Moderate	Very High	High
Polyisocyanurate PIR Board	High 0.021W/m2K	Yes	Yes	Yes	Low	High	High
Polyurethane PUR Board	High 0.022W/m2K	Yes	Yes	Yes	Low	High	High
Closed Cell Phenolic	High 0.020W/m2K	Yes	No	Yes / or Limited	Yes	High	High / Very
<b>Under Re-Testing</b> Fibreglass / Foamglas	Lower 0.041W/m2K	No	Yes	No	Yes	Very High	Very High
Aerogel / Spacetherm	Very High 0.013W/m2K	Yes	Yes	Limited	Yes	Low	Very High
<b>New Classification</b>				<b>New Classification</b>			

# Fire Legislation and Supplementary Guidance

- The Building Regulations are the general minimum Approved method - but not the only method



Building Regulations Approved Document B

BS 9991 and BS 9999

BS (PD) 7974 Suite – 8No. Fire Engineering Standards



HTM 05-02  
Healthcare



HTM 88  
Mental Health Houses



Building Bulletin 100  
Schools



Regulatory Reform Fire  
Safety Order (RRFSO)



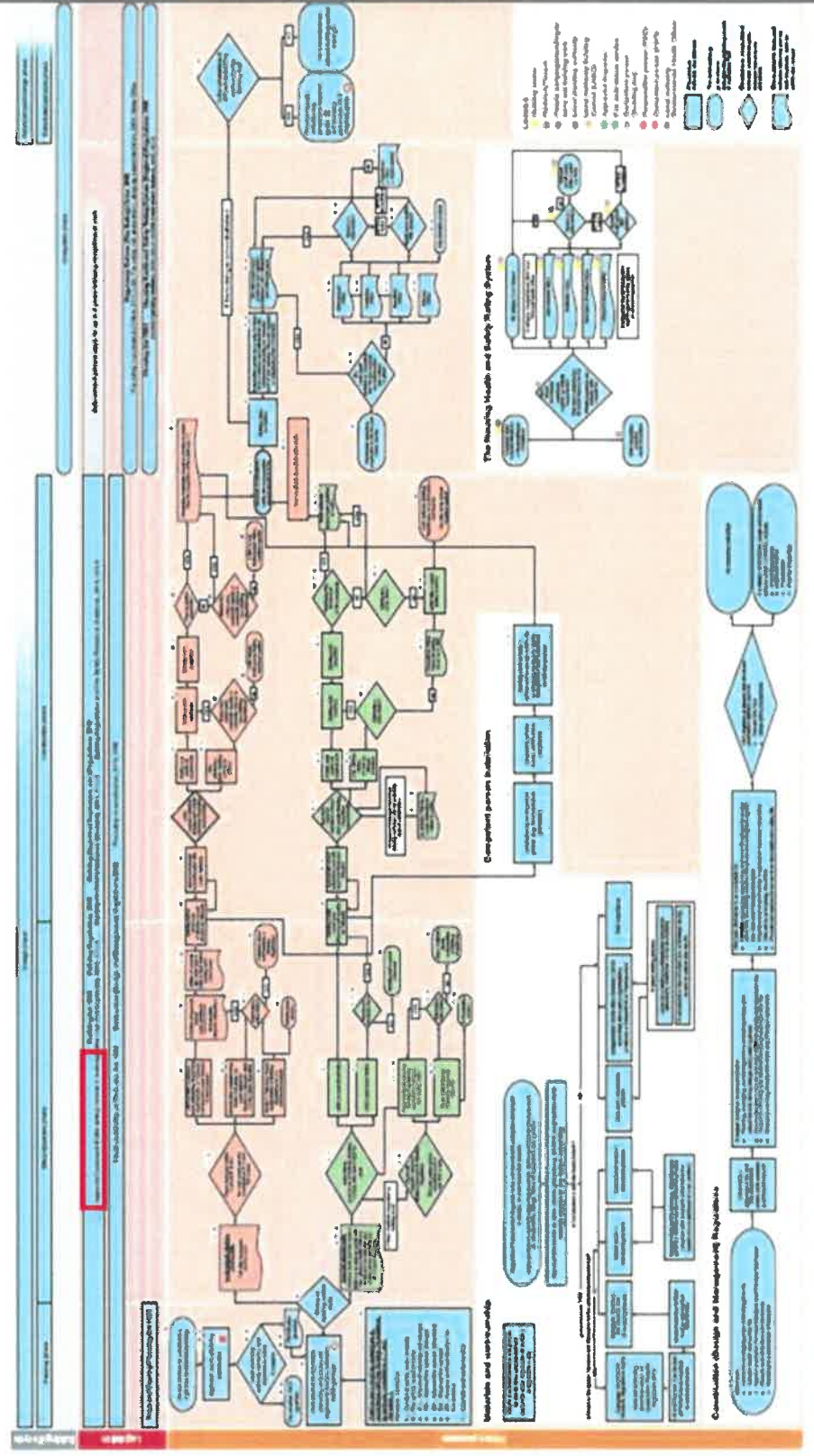
... and more



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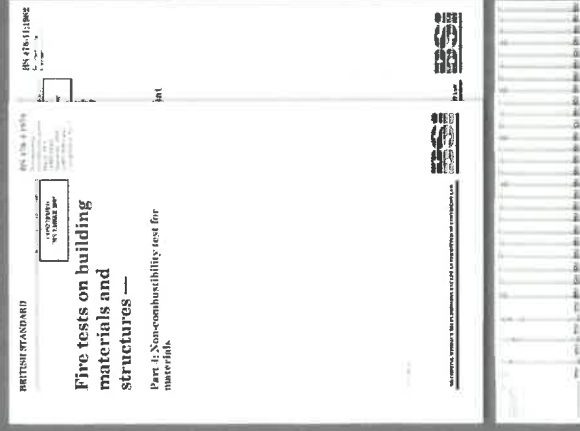
# Independent Review Mapping of HRRB Fire Safety Regulatory System

## Mapping the building and fire safety regulatory system – high-rise residential buildings



# Building Material Standards and Guidance

- In addition to standards there are a number of component and system fire testing documents.....



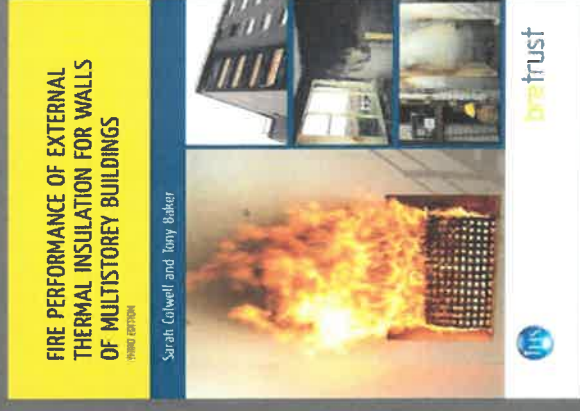
BS 476 series  
(33No. Standards)



BS EN 13501 series



BS 8414 parts



BRE BR 135

... and more





# Fire Classifications

- Under BS EN 13501 the classifications are:

Classification according to European Standard EN 13501-1

A1		A2-s1 d2	A2-s1 d1
A2-s1 d0	A2-s2 d2	A2-s2 d1	
A2-s2 d0	A2-s3 d2	A2-s3 d1	
A2-s3 d0			
B			
B2-s1 d0	B2-s1 d2	B2-s1 d1	
B2-s2 d0	B2-s2 d2	B2-s2 d1	
B2-s3 d0	B2-s3 d2	B2-s3 d1	
C			
C2-s1 d0	C2-s1 d2	C2-s1 d1	
C2-s2 d0	C2-s2 d2	C2-s2 d1	
C2-s3 d0	C2-s3 d2	C2-s3 d1	
D			
D2-s1 d0	D2-s1 d2	D2-s1 d1	
D2-s2 d0	D2-s2 d2	D2-s2 d1	
D2-s3 d0	D2-s3 d2	D2-s3 d1	
E			
E-d2			
F			

## Classification Definition Description

A1	Non-combustible	No contribution to fire
A2	Limited combustibility	Very limited contribution to fire
B	Combustible	Limited contribution to fire
C		Minor contribution to fire
D		Medium contribution to fire
E		High contribution to fire
F		Easily flammable

## Classification Smoke Emission During Combustion Description

Smoke emission during combustion	s1	Quantity/speed of emission absent or weak
	s2	Quantity/speed of emission of average intensity
	s3	Quantity/speed of emission of high intensity

## Classification Production of flaming droplets during combustion Description

Production of flaming droplets during combustion	d0	No dripping
	d1	Low dripping
	d2	High dripping

Where:

- The first is the main Euroclass combustibility rating, which will be the letter A1, A2, B, C, D, E or F.
- The second classification relates to smoke emission during combustion
- The third classification relates to the level of production of flaming droplets/particles during combustion.

# Fire Classifications – UK National Classifications

- Under BS 476 the classifications are:

National Class (England & Wales)	National Test Standard (England & Wales)
Non-combustible	BS 476: Part 4
Limited combustibility	BS 476: Part 11
0	BS 476: Part 6 BS 476: Part 7
1 & 2	BS 476: Part 7
3	BS 476: Part 7
4	BS 476: Part 7
Unclassified	No test

Classification	Spread of flame at 1.5 min		Final spread of flame	
	Limit mm	Limit for one specimen in sample mm	Limit mm	Limit for one specimen in sample mm
Class 1	165	165 + 25	165	165 + 25
Class 2	215	215 + 25	455	455 + 45
Class 3	265	265 + 25	710	710 + 75
Class 4	Exceeding the limits for class 3			

BS 476 - 7

8.3.7 Record the output from the thermocouples,  $E_r$ , in mV, at:

- 0.5 min intervals, up to and including 3 min from the time at which the gas was ignited; then
- 1 min intervals, up to 10 min from the time at which the gas was ignited; then
- 2 min intervals, up to 20 min from the time at which the gas was ignited.

If a multirange chart recorder is used, select the lower range scale of the chart recorder from the start of the test and adjust it to the higher range when 95 % full scale deflection is indicated.

8.3.8 Calculate the actual output rise  $E_c$ , in mV, for the calibration sheet from the following expression:

$$E_c = \frac{E_r - E_1}{2}$$

BS 476 - 6

- However please note the Definitions in Approved Document B2:

Appendix A Clause 13 Note: *'Class 0 is not a classification identified in any British Standard'.*

Appendix E; *'Class 0 A product performance classification for wall and ceiling linings'.*

# Combustibility and Surface Spread of Flame

- Be Aware! -there is sometimes confusion regarding a products classification for surface spread of flame to the products actual combustibility.



## Surface Spread of Flame:

*The choice of materials for walls and ceilings can significantly effect the spread of a fire and its rate of growth.*



## Combustibility:

*A combustible material is any material that, in the form in which it is used and under the conditions anticipated, will ignite and burn or will add appreciable heat to an ambient fire.*

## BS 8414 and BR 135 Tests for 'Systems'

- These tests, test individual components as a composite system as a large scale mock up.

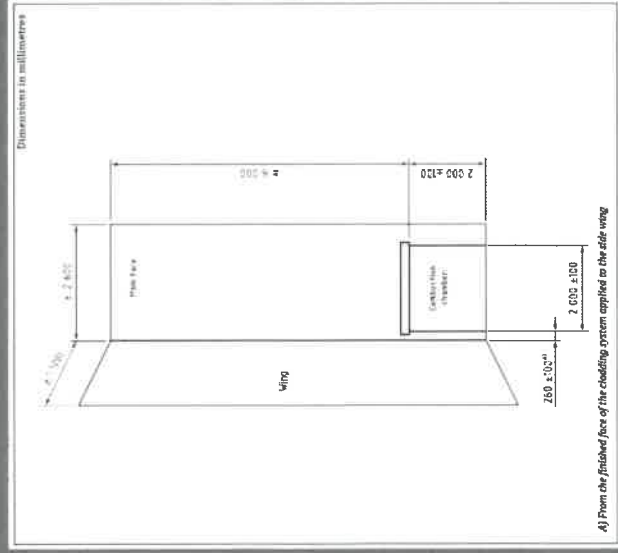


Figure 9: System with insulation comprising a material of limited combustibility, after test



Figure 10: Thermosetting core without adequate fixings or fire breaks

- Therefore, combustible products could be included within a façade system.

## Current Issues With Systems Testing

- A large number of BS 8414 products previously certified are now failing a retest.

Cladding Systems under BS 8414 are failing their current retests of façade systems.

Cladding System reports previously permitted as Desktop Studies based on BS 8414 have obviously been failing their tests also.

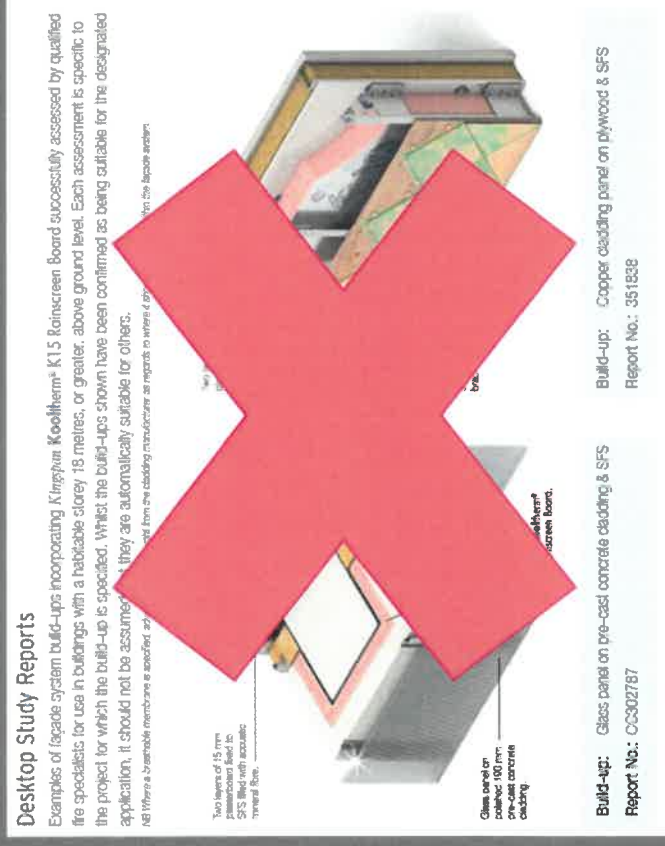
Insulations specified as suitable for use in buildings over 18 metres, have now found to have failed tests and withdrawn by manufacturers in these buildings.

Composite panels (such as ACM) have now also been found to have failed tests and withdrawn by manufacturers in buildings over 18 metres.

Previously accepted alternatives are now being rejected (for example the NHBC previous 9No. Flats being accepted in single stair un-lobbied flats).

## Desk Top Studies

- Previously BS 8414 tested systems could be modified if assessed in a Desk Top Study by a suitably qualified specialist to prevent the need to test each façade construction.



- Although these tests are now not permitted, a new BS 9414 is soon to be released which: *'enables a prediction to be made on the expected fire performance of a system under specified fire conditions'*

## Current Issues With Testing

- Certified Fire Doors Testing

Previous certified fire doors are now also failing retests of their original certification.

Fire doors have been found to be incorrectly tested under BS 476 as they have only been tested from one side when the test should achieve BOTH sides resistance.

Fire Doors are failing their tests as in some cases fire doors have been tested in different substrates (such as blockwork) but then installed into alternative substrates.

Certified Fire Doors have been found to have been fitted with non tested ironmongery and ironmongery not even certified.

