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DRIVING ENERGY EFFICIENCY

BEYOND FIRE PERFORMANCE

BS 476 VS EN 13501 & THE FUTURE OF FIRE SAFETY

26 Aug 2025

Dr Peter Cheng
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// AGENDA

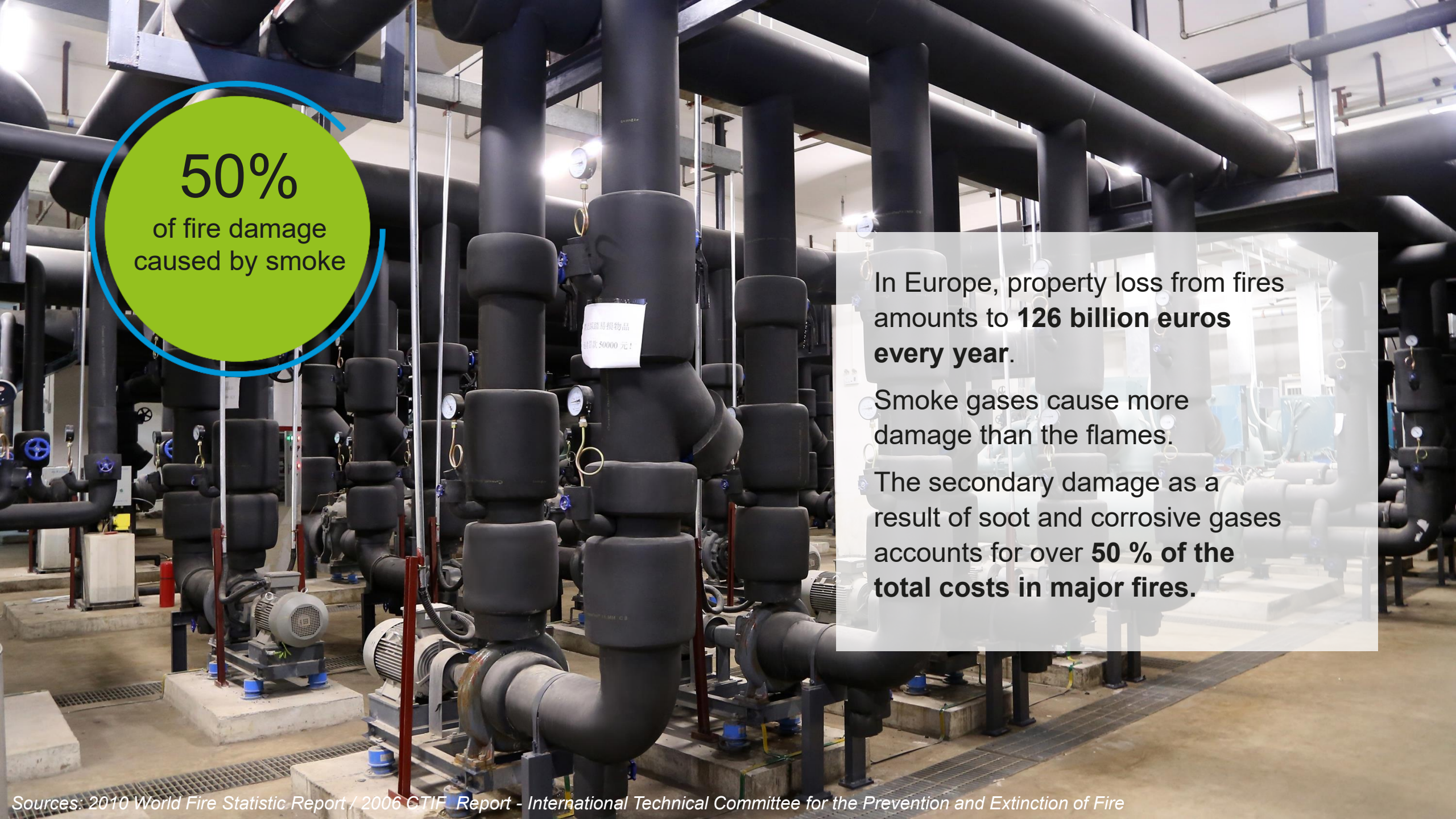
1. Fire safety and Smoke risk
2. British Standard BS 476 Vs European Norm EN 13501 – What is the difference?
    - Classification System
3. Industry implications of transitioning from BS 476
4. Summary and key takeaways

FIRE SAFETY

As smoke is a significant risk in a building fire, smoke density requirements for equipment insulation materials are becoming stricter.

When assessing the fire behaviour of building products, the European fire classification does not only tests the **flammability**, but also the **smoke density** and the **production of burning droplets**.

Sources: 2010 World Fire Statistic Report / 2006 CTIF Report - International Technical Committee for the Prevention and Extinction of Fire



50%
of fire damage
caused by smoke

In Europe, property loss from fires amounts to **126 billion euros every year**.

Smoke gases cause more damage than the flames.

The secondary damage as a result of soot and corrosive gases accounts for over **50 % of the total costs in major fires.**

Sources: 2010 World Fire Statistic Report / 2006 CTIF Report - International Technical Committee for the Prevention and Extinction of Fire

By reducing the smoke density, this **improves visibility and respiration**, thus extending the time for safer evacuation in the event of a fire.

Sources: 2010 World Fire Statistic Report / 2006 CTIF Report - International Technical Committee for the Prevention and Extinction of Fire

// Catalyst for Change - Grenfell Tower Fire (14 June 2017)

Transitioning from British Standard (BS 476) to European Norm (EN 13501)

THE STRAITS TIMES | Grenfell Tower fire inquiry blames deaths on incompetence and greed

Grenfell Tower fire inquiry blames deaths on incompetence and greed

A total of 72 people died when fire ripped through a 23-storey social housing block in the early hours of June 14, 2017.
PHOTO: EPA-EFE

// Catalyst for Change - Grenfell Tower Fire (14 June 2017)

Transitioning from BS 476 to EN 13501

Omar Alhaj Ali, Lived on the 14th floor

” *When we heard the sirens, we jumped out of bed and saw the fire. Mohammad told me to be calm. He told me we were going to get out. We opened the front door but there was* ***so much smoke, we couldn’t breathe****.“*

“Then the door opened and a firefighter grabbed me. ***I was breathing smoke. I tried to look behind me but it was all dark.*** *The firefighters pushed me down the stairs.”*

Christos Fairbarn, Lived on 15th floor

“ I opened the door, and ***the smoke was so thick. I tried to leave the flat three times, and each time the smoke was too thick****.”*

David Badillo, one of the firefighters on duty during Grenfell Tower Fire

“ As you do after you’ve put the fire out, you use your thermal imaging camera have a look around to check, to make sure there’s no hot spots. And ***that’s when they noticed the droplets of flame dripping, and they realized that the fire had got out.****.”*

Ed Daffarn, Lived on the 16th floor

“About 1am on the night of the fire, I heard my neighbour’s smoke alarm. When I opened my front door, ***the corridor was full of black smoke****.”*

*“****I couldn’t see beyond my nose. The emergency door was only a few metres away, but I couldn’t find it****. I panicked and started breathing in the smoke.”*

https://www.theguardian.com/uk-news/2022/jun/13/grenfell-tower-fire-survivors-five-years-former-residents-14-june-2017
https://www.theguardian.com/uk-news/2022/jun/13/grenfell-fire-survivors-five-years-anniversary
Netflix Documentary: Grenfell: Uncovered
https://www.bbc.co.uk/news/resources/idt-sh/grenfell_voices

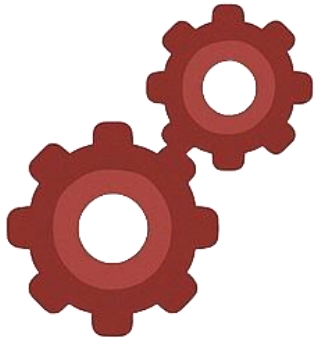
// Singapore Fire Code and Product Listing Scheme

Singapore Fire Code

- Set minimum fire safety standards
- Guides building design and construction
- Ensure consistency and legal compliance

Product Listing Scheme (PLS)

- Certifies fire safety products
- Ensure quality and reliability
- Support Fire Code compliance



How They Work Together

- PLS products are required for Fire Code compliance
- Qualified Person verify product certification
- Enhances safety and accountability

// Product Listing Scheme Process

Product Testing

- Test product at an accredited laboratory to meet accepted test standards (e.g. BS, EN, ASTM, ISO, UL)

Certification Application

- Submit application to SCDF recognized Certification Body

Evaluation & Factory Audit

- Certification Body evaluates test results and conducts factory audit (if required)

Issuance of CoC

- Certification Body issues Certificate of Conformity (CoC) if product complies

Product Listing & Surveillance

- Product is listed under Product Listing Scheme and subject to periodic surveillance testing according to accepted test standard (e.g. BS, EN, ASTM, ISO, UL)

// Withdrawal of British Standard (BS 476)

What is BS 476?

- British Standard for fire testing of building material
- Key parts
  - Part 4 – Non-combustibility
  - Part 6 – Fire propagation
  - Part 7 – Surface spread of flame
  - Part 11 – heat emission
  - Part 20-24 – Fire resistance of elements (walls, floors, ceilings, and fire doors etc.)

Why is BS 476 Being Withdrawn?

- UK adopted harmonised EN fire classification system, EN 13501 series for fire performance
- To support international consistency and regulatory compliance

Key Timeline

Year	Milestone
Pre-2000s	BS 476 widely used in UK & Internationally
2002-2010	EN 13501 series introduced gradually
2020s	EN standards become dominant across Europe
2024-2029	Phased withdrawal of BS 476 series by BSI

// Current Status of British Standard (BS 476)

Standard Withdrawn

BS 476-4:1970

Fire tests on building materials and structures - Non-combustibility test for materials

Published: 30 Apr 2014 · Withdrawn: 27 Sep 2024

Standard Withdrawn

BS 476-11:1982

Fire tests on building materials and structures - Method for assessing the heat emission from building materials

Published: 31 Aug 1982 · Withdrawn: 4 Mar 2025

Standard Withdrawn

BS 476-6:1989+A1:2009

Fire tests on building materials and structures - Method of test for fire propagation for products

Published: 31 Mar 1989 · Withdrawn: 4 Mar 2025

Standard Withdrawn

BS 476-7:1997

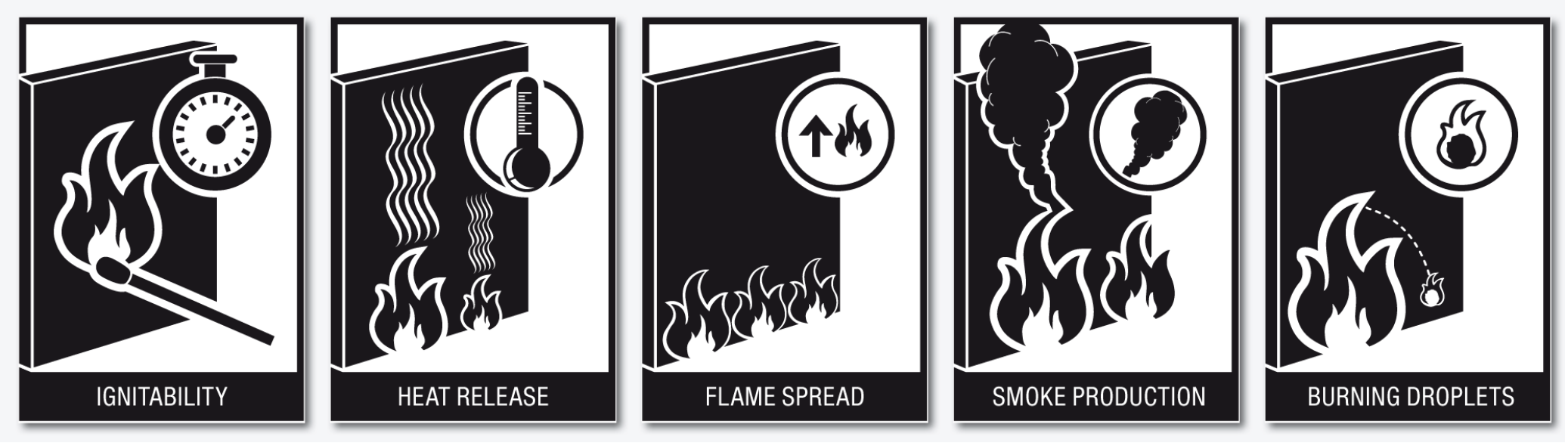
Fire tests on building materials and structures - Method of test to determine the classification of the surface spread of flame of products

Published: 15 Jan 1997 · Withdrawn: 4 Mar 2025

BS 476 Part 20 to 23 to be phased out

// Reaction to Fire Properties of Building Product

- The characteristic of a combustible material during fire include



- These factors poses safety issue
- Some building material Product Listing Scheme (e.g. material for wall/ceiling/floor, thermal insulation material) tested to BS 476
  - Limit to heat release and flame spread

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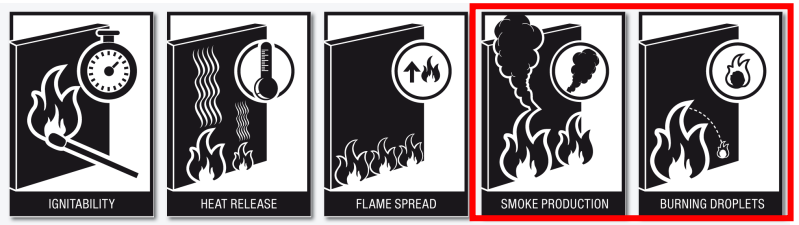
// British Standard (BS 476) vs European Norm (EN 13501-1)

- Singapore Fire Code 2023, Table 3.11A, Note (2) stated BS/EN refers to the following test standards. Meeting an EN standard implies that the corresponding BS standard is complied with but not vice-versa

BS 476 Classification	Non combustible	Limited combustible	Class 0	Class 1 Class 2	Class 3		Class 4
Test required	BS 476-4	BS 476-11	BS 476-6&7	BS 476-7			
EN 13501-1 Classification	A1	A2	B	C	D	E	F
Test required	ISO 1182 & ISO 1716		ISO 11925-2				
		EN 13823					
Smoke rating		s1, s2, s3					
Droplet rating		d0, d1, d2					



// Enhancing Fire Safety: Why Smoke and Droplets Matter

The Risk

- Smoke and flaming droplets are major contributors to fire-related injuries and death

Current Limitation

- BS 476 does not assess smoke production or flaming droplet

EN 13501-1 Advantage

- EN 13501-1 includes smoke and droplet classification for a more complete fire behavior profile

Smoke Production Rating (s)

Indicates how much smoke is released during combustion

s1		Little / no smoke
s2		Medium smoke
s3		High smoke

Flaming Droplets Rating (d)

Indicates presence of burning droplets/particles

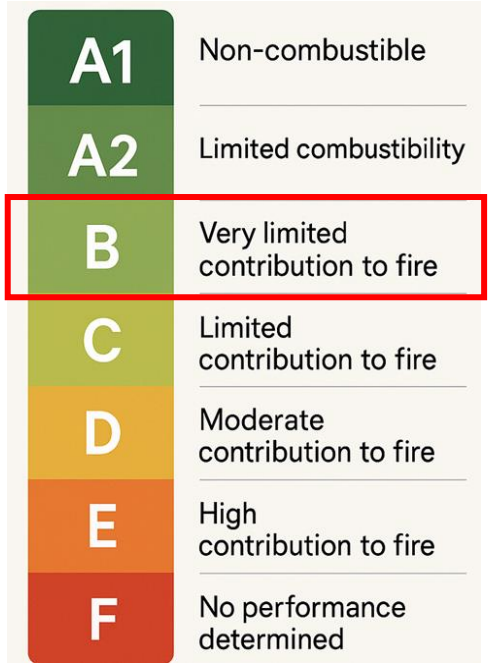
d0		No flaming droplets/particles
d1		Some flaming droplets/particles
d2		Significant flaming droplets/particles

// A More Holistic and Effective Building Product Fire Classification

- Combined Rating Example:
  - A product rated as

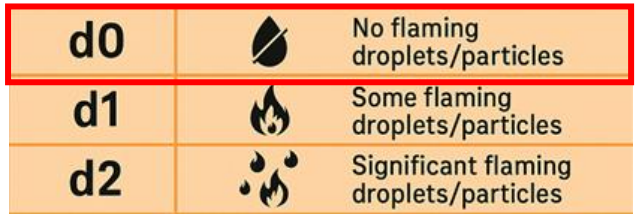
B-s2, d0

Reaction to Fire:



Smoke production rating:

Flaming droplet rating:



It means:

- **B**: Very limited contribution to fire
- **s2**: Emits medium smoke
- **d0**: No flaming droplets/particles

// Industry implications of transitioning from BS 476

Challenges in Transitioning from BS 476 to EN 13501

Market resistance & industry adaptation

- Availability of Material Selection
- Testing availability and capacity
- Costs & certification barriers

Timeline, market readiness and acceptance

- Phased approach
- Implementation for targeted areas

Countries	Escape routes	Public buildings (Theatre, cinema)	High-rise building	Dwellings/ technical rooms	Others
Italy	B-s2, d0	B-s2, d0	B-s2, d0	D-s3, d2	D-s3, d2
Netherlands	B-s1, d0	B-s2, d0	B-s2, d0	B-s2, d0 / B-s3, d0	B-s2, d0 / B-s3, d0
Norway	B-s1, d0 / C-s1, d0	C-s3, d0	C-s3, d0	D-s3, d0	D-s3, d0
Switzerland	A1/A2-s1, d0	D-s2, d1 or E in fire resistance shafts or E with a metal cladding	D-s2, d1 or E in fire resistance shafts or E with a metal cladding	material with classification cr (critical) is allowed to use without metal cladding	D-s2, d1 or E in fire resistance shafts or E with a metal cladding
United Kingdom	B-s3, d2	B-s3, d2	B-s3, d2	C-s3, d2 for circulation spaces	

Euroclasses (EN 13501-1) : *Reaction to Fire, (A1, A2, B, C, D, E, F)*
Smoke Production Rating, (s1, s2, s3)
Flaming Droplets Rating (d0, d1, d2)

Key Takeaway

UK’s adoption of EN 13501 and withdrawal of the BS 476 series is prompting countries referring to BS to review their building codes.

Incorporating smoke and droplet index requirements will significantly enhance the Fire Code's effectiveness in mitigating the real dangers posed by fire incidents, leading to safer buildings and improved evacuation conditions.

Time for us to act!

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- High performance insulation saves energy
- Acoustic products against noise pollution
- Passive Fire Protection system contribute to a safer environment
- Longer service life and lower overall installed cost
- Engineered insulation solution contributes to green building certification
- Product and installation training

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“Beyond Fire Performance - BS 476 Vs EN 13501 and the Future of Fire Safety in Singapore”

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