An Overview of Fire Safety in European Taller Buildings

Incorporating a Framework for Fire Safety

Fire Australia 2021 Conference
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FIRE AUSTRALIA 2021 Conference & Tradeshow

MODERN BUILDING ALLIANCE
Safe and sustainable construction with plastics

www.modernbuildingalliance.eu

About the Modern Building Alliance

- European Alliance of trade associations and companies representing the **plastics industry in the construction sector** (thermoplastics and thermosets).
- Our primary goal is for **greater fire safety across the construction industry**. It is a key driver of our product design and manufacturing: improving the fire safety of buildings is a **joint responsibility of the whole value chain** involved in building and construction.
- That is why, by engaging with policy makers and stakeholders, we are committed to **supporting the EU in ensuring safe and sustainable construction** for people across Europe.
- The Australian Modern Building Alliance (AMBA) is our sister organisation

AUSTRALIAN MODERN BUILDING ALLIANCE
Safe and sustainable construction with polymers

Members of the Modern Building Alliance in 2021:

Our priorities for Fire Safety

A holistic approach to fire safety requires:

- Better **statistics at EU level** in order to identify risk factors and effective fire safety measures

- Easily implementable solutions such as **prevention, detection and awareness raising**

- Assessment of the whole **system performance** instead of individual materials

- Correct use of products and systems in **accordance with all regulations** and producers' guidelines

The European Fire Information Exchange Platform (FIEP)

Fire Safety: Who does what ?

Under the current provisions of the Treaty on European Union, the Union does not have the competence regarding the fire safety of buildings.

Important differences in the climatic and geographic conditions and also in building traditions exist among the Member States. For this reason fire safety of buildings is better regulated at Member States or local level.

The Commission does not dispose up until today compelling proof that Member States cannot ensure the fire safety of their citizens.

NEW CHALLENGES

During the last years, technological developments and the need for more energy-performing buildings resulted in a large choice of new construction products offered in the market for buildings and their facades.

These modern ways of construction like, for example, the modern facades systems, and the need to extensively renovate older buildings have changed significantly our buildings.

They may represent a challenge for the regulatory authorities of the Member States.

Source: Slides extracted from presentation: https://www.modernbuildingalliance.eu/assets/uploads/2018/11/DG-Grow_presentation.pdf

The European Fire Information Exchange Platform (FIEP)

NEW CHALLENGES NEED CO-OPERATION

The European Commission considers that fire safety in buildings would be enhanced by stimulating the co-operation among Member States and the exchange of information between Member States and relevant stakeholders on best practices and lessons learned in the area of fire safety.

To achieve this fruitful synergy the European Commission, has created the Fire Information Exchange Platform (FIEP). The creation of FIEP was also supported by the Estonian Presidency of the Council.

- The European Fire Information Exchange Platform (FIEP) has been set-up by the European Commission following the Grenfell Tower fire

- The European Commission also identified five key priorities for which working groups have been established :

  1. Common terminology and fire statistics

     ➔ **EU FireStat** project (2020-22) www.eufirestat-efectis.com

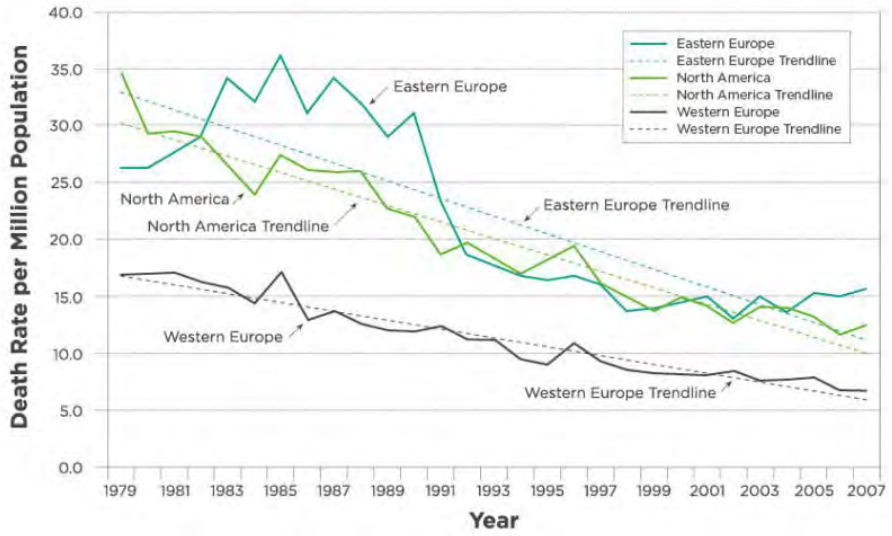
  2. The application of fire prevention principles
  3. The regulatory approach for new products, including high-rise buildings
  4. Exchange of experience from fire accidents
  5. Fire engineering approach in building regulations

Source: Slides extracted from presentation: https://www.modernbuildingalliance.eu/assets/uploads/2018/11/DG-Grow_presentation.pdf

State of play: some facts

Fire Safety Fact 1: A lack of fire statistics but general trend is good

Fire Death Rates per Million Population



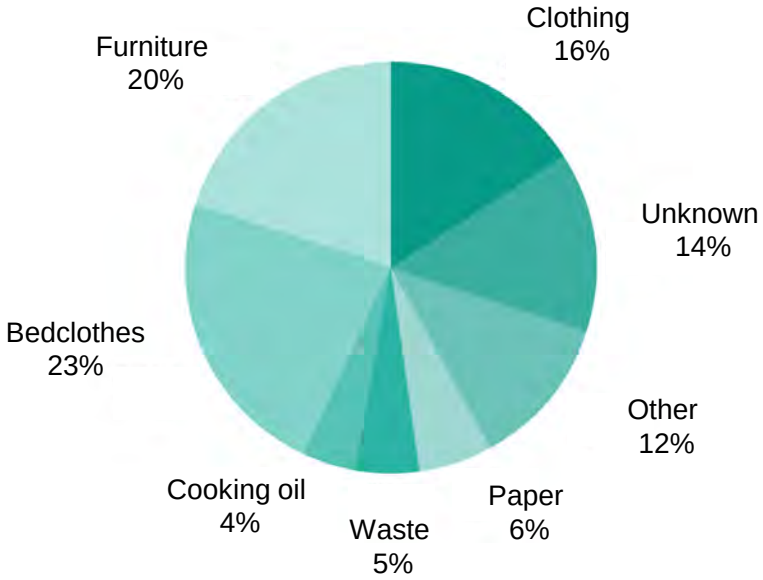
There is a lack of EU harmonised data on fire and fire victims but current data indicate that the **number of victims of fire-related incidents is steadily declining.**

This decline has occurred in spite of an increasing and ageing population across the EU and a significant rise in the use of combustible materials.

Source USFA – Fire Death Rate Trend : International Perspective, 2011
https://www.modernbuildingalliance.eu/assets/uploads/2018/05/Fire-Death-Rate-Trends-An-International-Perspective.pdf
To know more : http://www.modernbuildingalliance.eu/fire-safety-statistics/

Fire Safety Fact 2: Most fires start in the building contents

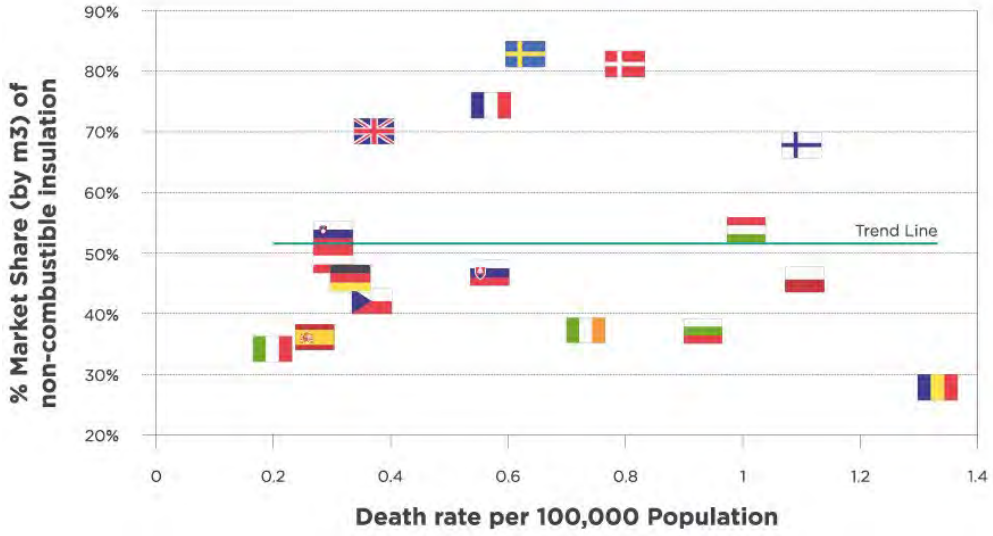
First material involved



- Fires usually start in the dwellings content (bedclothes, furniture, clothing…).
- Most common fire causes are preventable (smoking, cooking, electrical defaults,…)

Source Kobes and Groenewegen, 2011
To know more: http://www.modernbuildingalliance.eu/fire-safety-statistics/

Fire Safety Fact 3 : No correlation between insulation type & fire fatalities



The differences in fire death rates in Europe **cannot be explained by the market share of different types of insulation materials**.

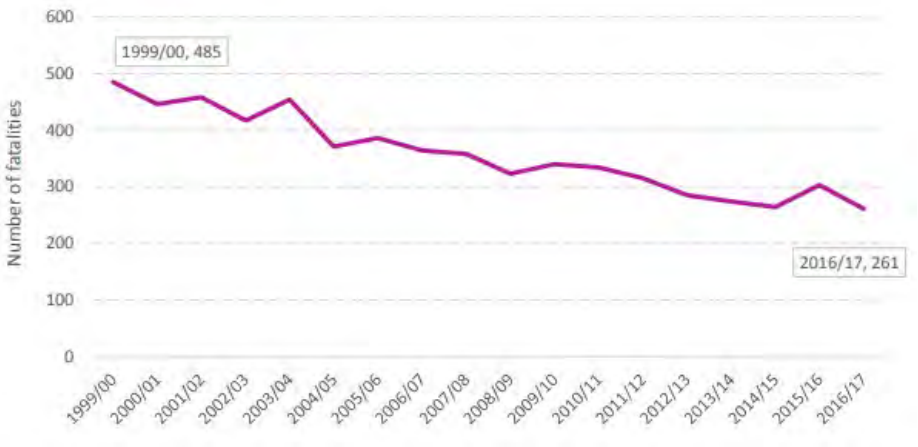
Indeed, Denmark, where non-combustible stone wool is preferred, had a higher rate of deaths in 2008-10 than Germany, where plastic foam insulation has a greater market share.

Sources : WHO, IAL consultants et USFA
To know more : http://www.modernbuildingalliance.eu/fire-safety-statistics/

Fire Safety Fact 4: Multiples factors are playing a role

Number of fire-related fatalities

In England
Collected via the Incident Recording System (IRS)
From 1999-2000 to 2016-2017



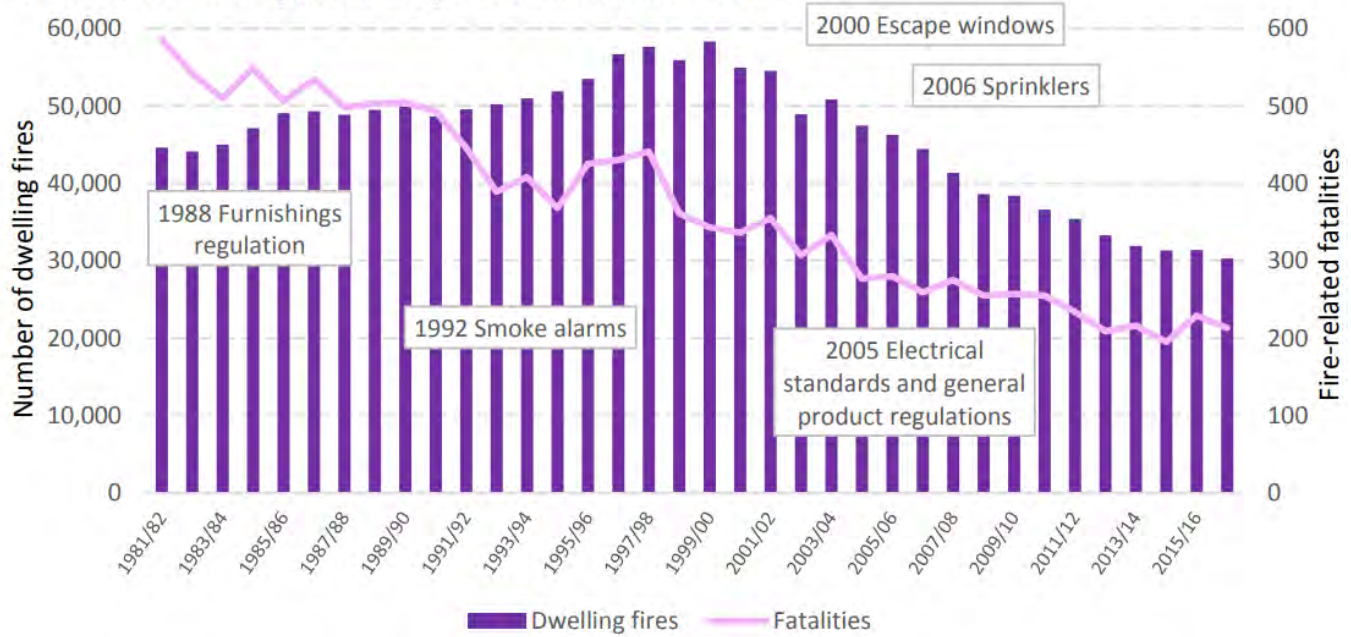
The number of fire fatalities in England has been falling steadily **despite the ageing population and overcrowding** because of:

- Changing cooking habits
- Increase in smoke alarm ownership
- Reduction in smoking
- Reduction in drug and alcohol use
- Reduced arson
- Improved safety standards (furniture & furnishing) and improved building regulations
- Preventative work and education

Source : Focus on trends in fires and fire-related fatalities, UK Home Office, October 2017, p.9
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650869/focus-trends-fires-fatalities-oct17.pdf

Fire Safety Fact 5: Improved safety standards & building regulations worked

Figure 12: Dwelling fires and fire-related fatalities, shown against regulations aimed to increase fire safety, IRS, England; 1981/82 to 2016/17



Source : Focus on trends in fires and fire-related fatalities, UK Home Office, October 2017, p.18
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650869/focus-trends-fires-fatalities-oct17.pdf

Fire Safety Fact 6 : Fire prevention clearly works

Fire prevention clearly makes a difference:

- London : the number of fires and related deaths have been halved since the fire brigade adopted prevention as a core strategy
- Estonia : reduction by a factor of 3 to 4 in 10 years.

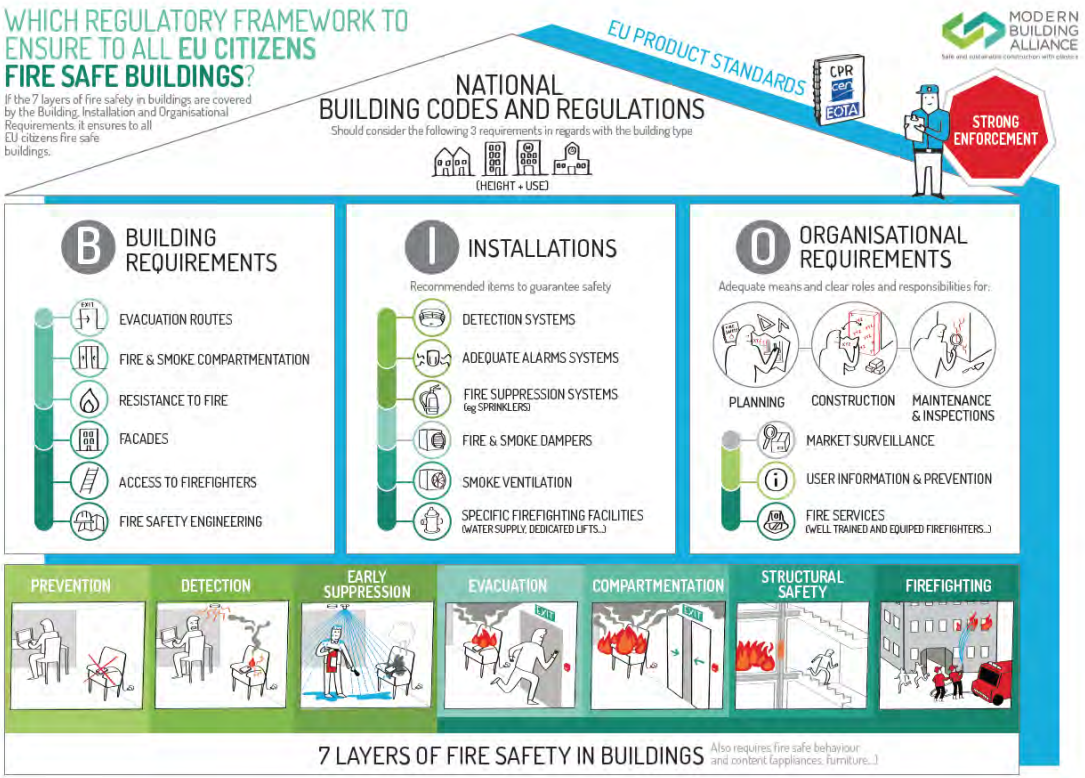
Source : London Fire Brigade, Estonian Rescue Board (presented at FIEP meeting, Sept 2018)
To know more : http://www.modernbuildingalliance.eu/fire-safety-statistics/

How to ensure Fire Safety in Buildings?

A holistic approach to fire safety, starting with prevention

Full EU Fire Safety Guide: https://www.modernbuildingalliance.eu/EU-fire-safety-guide

B.I.O. framework: a proposed regulatory framework for fire safety

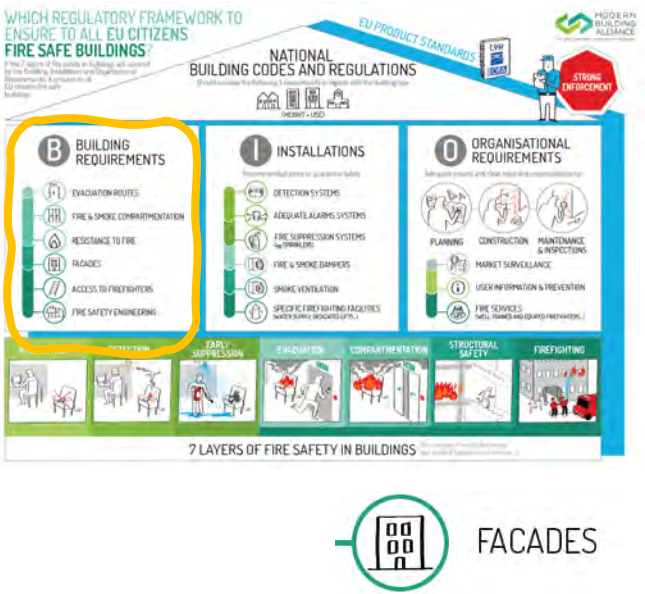


Watch the video that explain this framework:
https://www.modernbuildingalliance.eu/b-i-o-framework

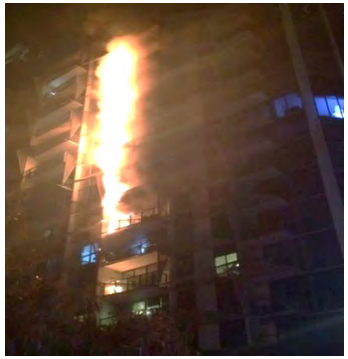
Proposed regulatory framework

B - Building Requirements: focus on Façades

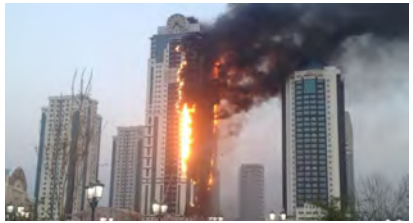
In national building codes



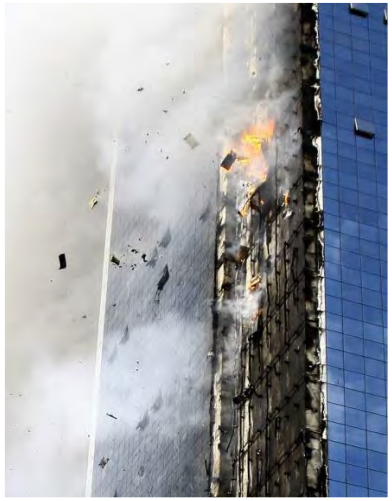
Fire safety of façades



Lacrosse Tower Melbourne 2014



Hotel Grozny 2013



Polat tower Istanbul 2012

Grenfell tower, London, 2017

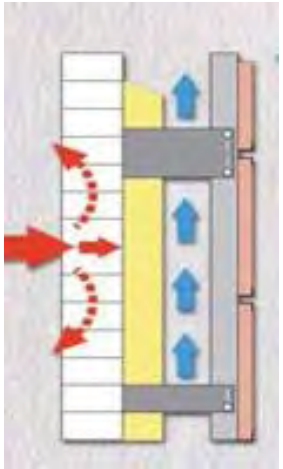
The Torch tower Dubai 2015

Address hotel Dubai 2016

Fire safety of façades : example of ventilated façade

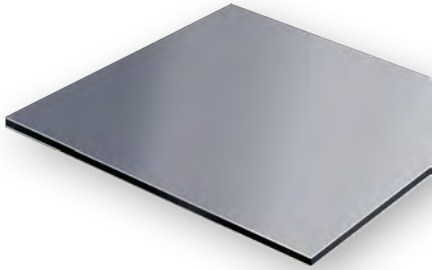
Ventilated Façade:

- Insulation
- Cavity
- Cavity Barriers
- External Cladding



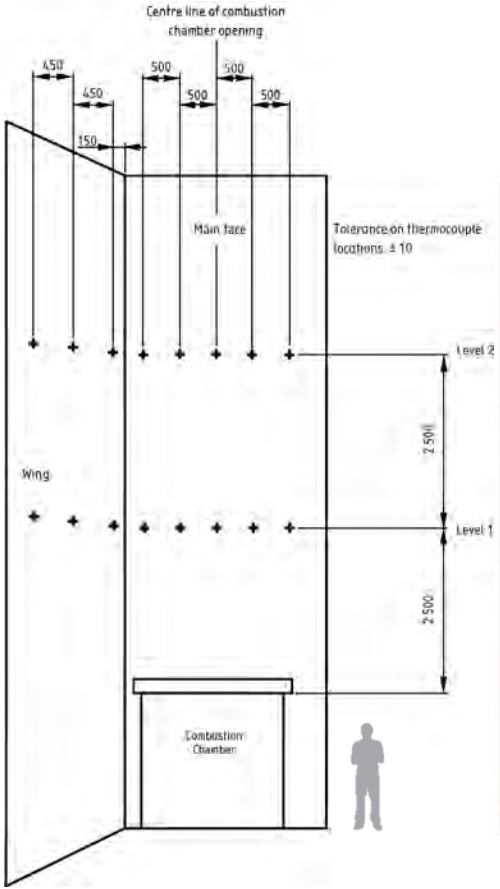
ACM External Cladding:

- Aluminium Composite Material
- 3 common core types PE/FR/A2
- No insulation properties



Grenfell tower,
London, 2017

Large scale tests of façades : example BS 8414



Official testing programme commissioned by British government post Grenfell fire

(DCLG - Department for Communities and Local Government)

Test	Build up	Result
Test 1	100 mm PIR – PE core ACM	Fail - 8,45 mins
Test 2	180 mm MF – PE Core ACM	Fail - 7,09 mins
Test 3	100 mm PIR – FR core ACM	Fail - 25.12 mins
Test 4	180 mm MF – FR Core ACM	Pass
Test 5	100 mm PIR – A2 core ACM	Pass
Test 6	180 mm MF – A2 Core ACM	Pass
Test 7	100 mm PF – FR core ACM	Fail – 28,14 mins

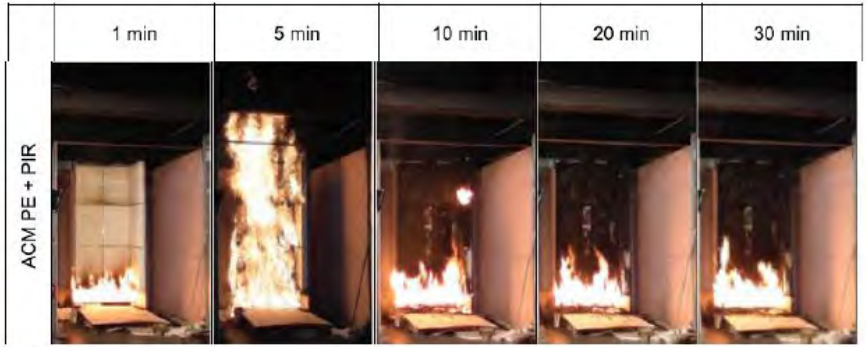
PE core ACM : Aluminum Composite Material with polyethylene core
FR core ACM : Aluminum Composite Material with Fire Retardant core
A2 core ACM : Aluminum Composite Material with limited combustibility core
PIR : Polyisocyanurate insulation
MF : Mineral fibre insulation
PF : Phenolic foam insulation

Reference of the DCLG testing programme: https://www.gov.uk/guidance/aluminium-composite-material-cladding

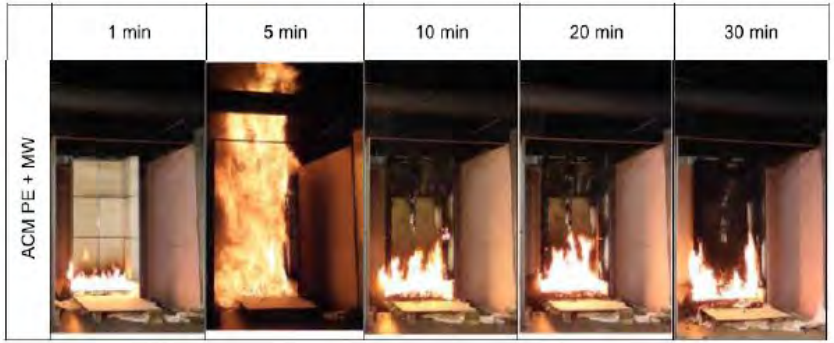
Fire safety of facades : example of ventilated facade

Medium scale tests (ISO 13785-1) of ventilated façades :

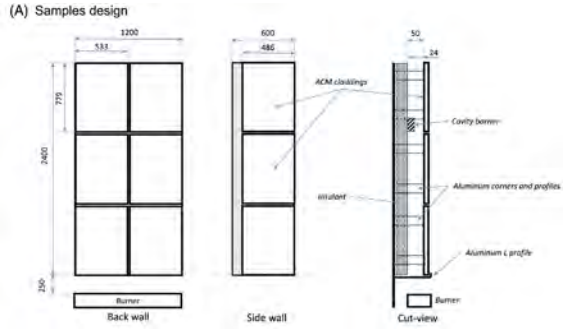
PE core ACM and different type of insulation



PIR insulation + ACM PE



Mineral fiber insulation + ACM PE



Source and reference:

FAM FIRE AND MATERIALS An International Journal

SPECIAL ISSUE PAPER | Open Access

Study of fire behaviour of facade mock-ups equipped with aluminium composite material-based claddings, using intermediate-scale test method

Eric Guillaume, Talal Fateh, Renaud Schillinger, Roman Chiva, Sebastian Ukleja

First published: 22 May 2018 | https://doi.org/10.1002/fam.2635 | Citations: 16

Reference accessible here:
https://onlinelibrary.wiley.com/doi/full/10.1002/fam.2635

Fire safety of facades : example of ventilated facades

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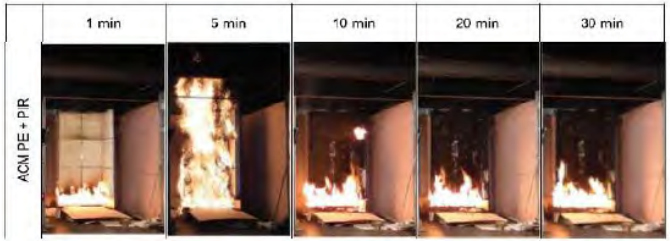
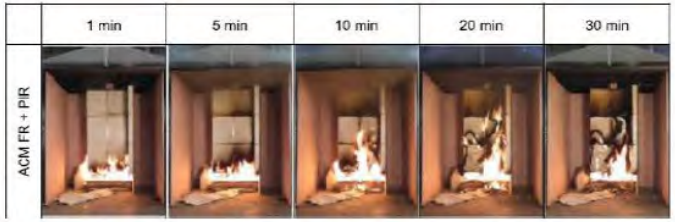
Medium scale tests (ISO 13785-1) of ventilated façades :
PIR insulation and different types of cladding materials

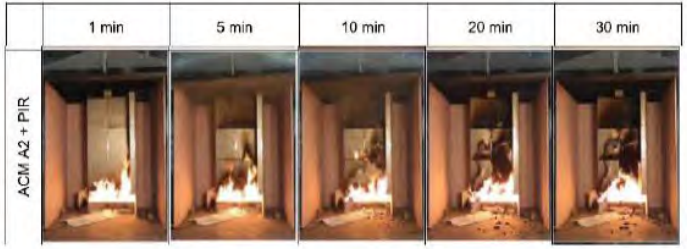
PIR
+ ACM PE



PIR
+ ACM FR



PIR
+ ACM A2



Source: Study of fire behaviour of facade mock-ups equipped with aluminium composite material-based claddings, using intermediate-scale test method
Reference accessible here:
https://onlinelibrary.wiley.com/doi/full/10.1002/fam.2635

Medium scale tests (ISO 13785-1) of ventilated façades :
Mineral fiber insulation + ACM A2

MW
+ ACM A2

Fire safety of facades : example of ventilated facade

Medium scale tests (ISO 13785-1) of ventilated façades :

Maximum heat release rate for different combinations

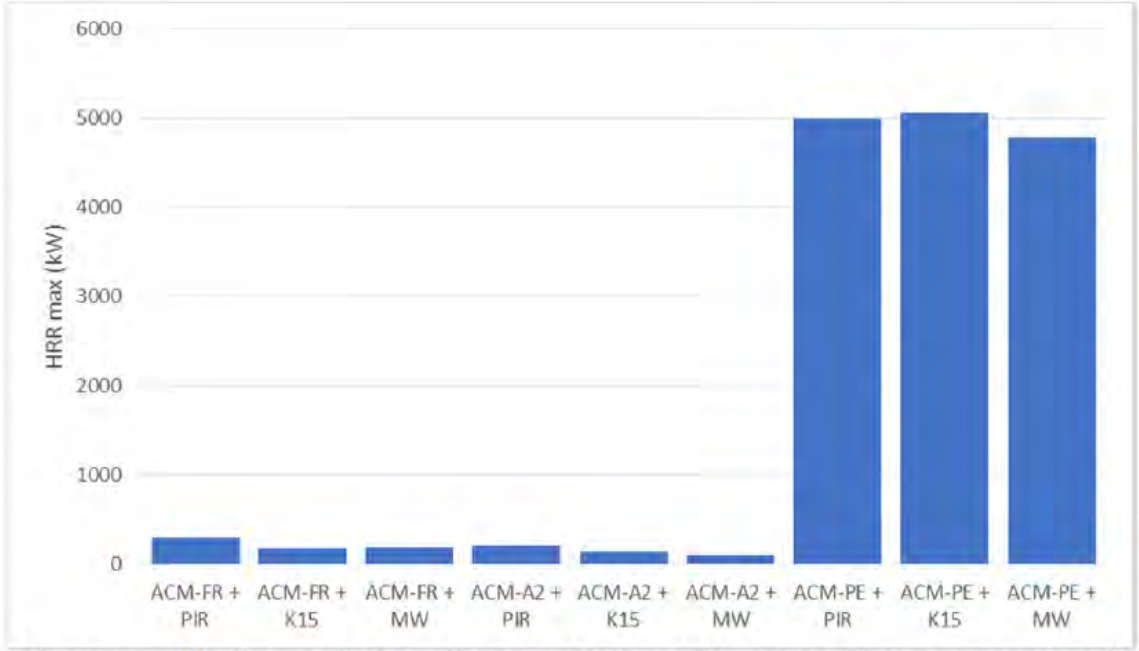
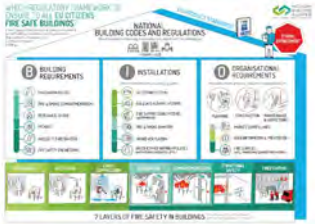


Figure 7 - Maximum heat release rate (contribution of burner removed)

Source: Study of fire behaviour of facade mock-ups equipped with aluminium composite material-based claddings, using intermediate-scale test method
Reference accessible here:
https://onlinelibrary.wiley.com/doi/full/10.1002/fam.2635

Our recommendations to ensure the fire safety of Façades



➔ AIM: Limit the fire spread

For **façade systems** of taller buildings:

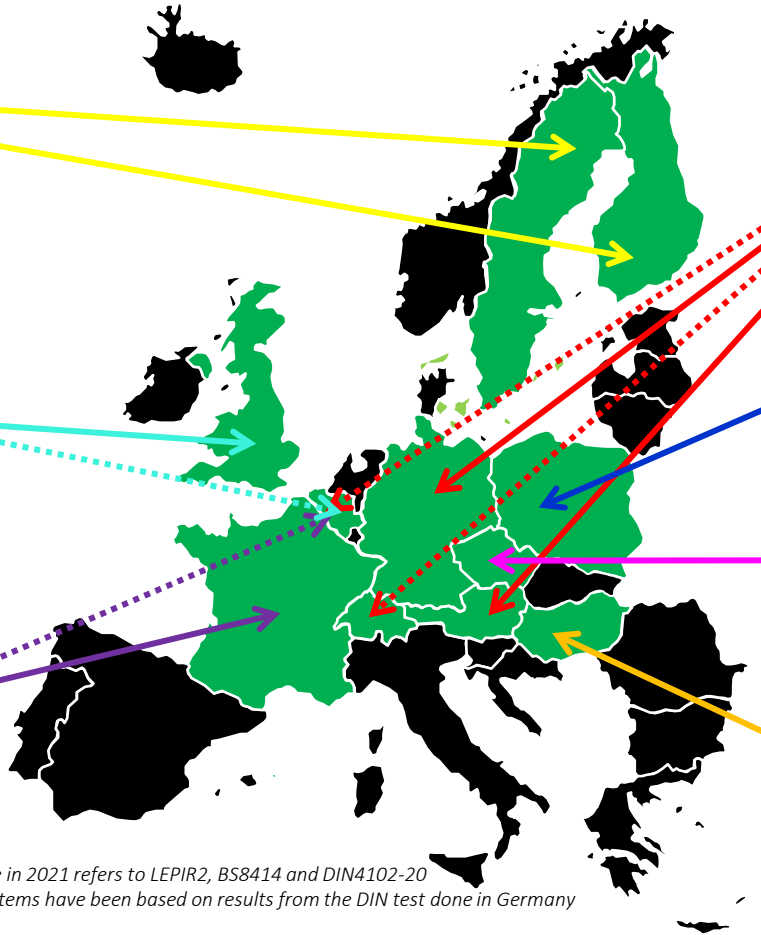
- Use **large scale system testing** as basis for all systems (regardless of combustibility of components)
- Consider **all elements of the system:** Fire barriers in cavities are for example essential for ventilated facades
- Ensure **unambiguous description** of system components via harmonized specifications
- Define the **extended application** of large-scale test results
  (allowed variations in the systems, e.g. thickness)

Façade system tests in EU: different scales, different configurations

SP FIRE 105

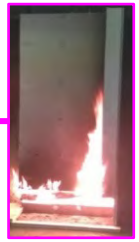
BS 8414

LEPIR 2



DIN4102-20

PN-B02867



ISO13785-1

MSZ 14800-6

**In Belgium, a new regulation that should enter into force in 2021 refers to LEPIR2, BS8414 and DIN4102-20*

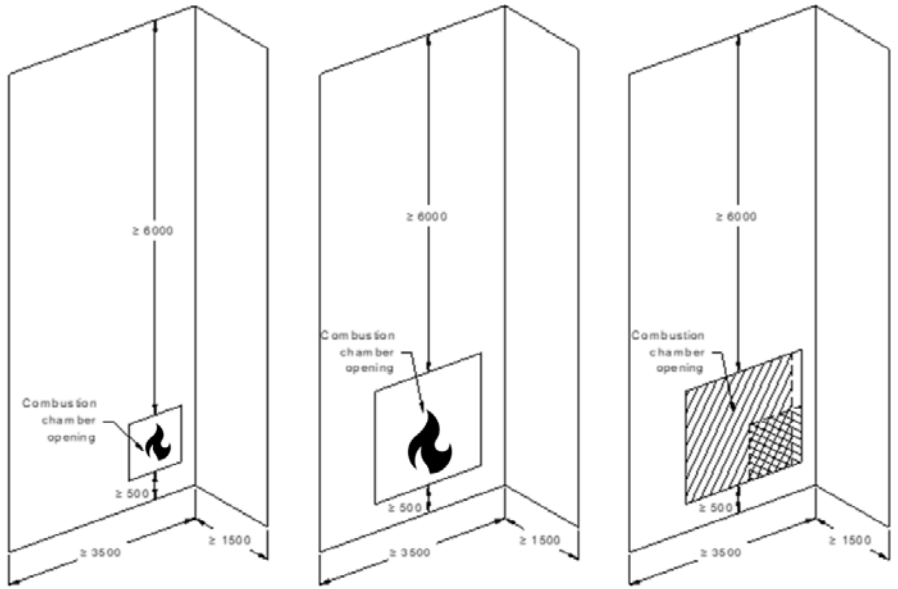
*** In Switzerland application rules for certain types of systems have been based on results from the DIN test done in Germany*

Towards an harmonized European large scale test method

FACADES

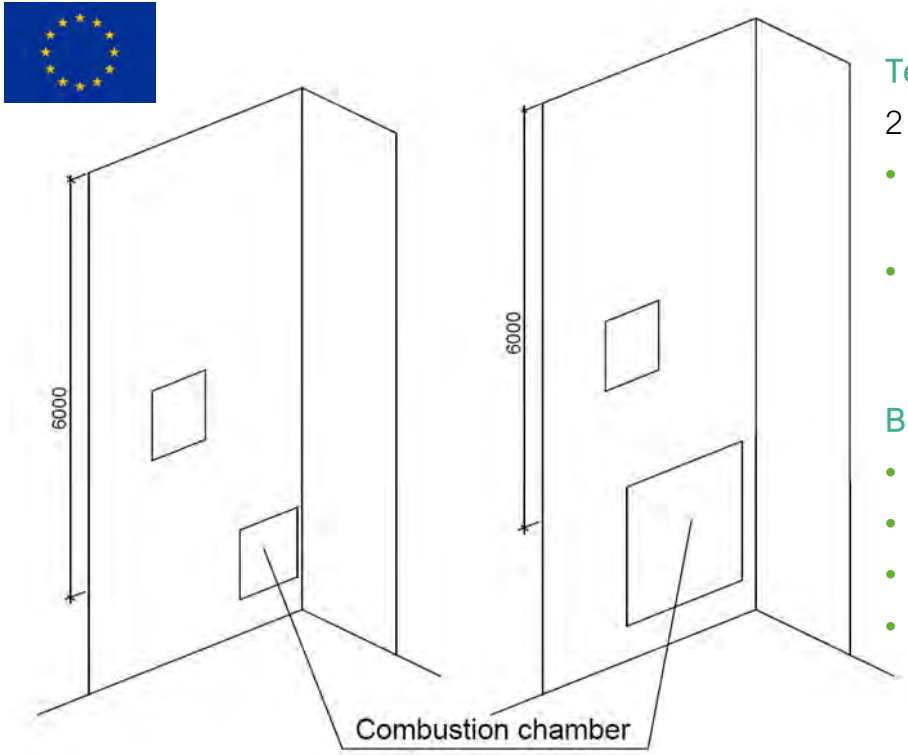
➔ A new European approach to assess the fire performance of façades is under development – sponsored by the EU

Under development



Access the consortium website:
https://www.ri.se/en/what-we-do/projects/finalisation-of-the-european-approach-to-assess-the-fire-performance-of-facades

European large scale test method: basic concept for the future test



Principle drawing of the test method, medium fire exposure represented on the left and large fire exposure on the right.

Test rig size similar to BS 8414

2 configurations for the wooden crib and combustion chamber:

- **Medium exposure** :wood crib and combustion chamber similar to DIN 4102-20
- **Large exposure** : wood crib and opening of the chamber similar to BS 8414

BUT several changes, a.o.:

- Secondary window opening as used in France and Scandinavia
- Size of the combustion chamber inside
- Type of wood crib
- Assessment criteria
  - ✓ Vertical flame spread
  - ✓ Lateral flame spread
  - ✓ Falling burning parts and droplets
  - ✓ (optional: glowing and smouldering)

Source: Call for Tender :
Finalisation of the European Approach to Assess the Fire Performance of Facades, Tender Specifications Part 2 - Technical specifications, European Commission DG Grow, 2019
https://etendering.ted.europa.eu/cft/cft-document.html?docId=60146

What is the role of products manufacturers ?

Product manufacturers have direct roles:

- Contribute to the development of **robust** product **standards**
- Have their products classified and labeled according to these standards and to have **adequate quality control**
- Present clear, detailed and up-to-date **information about their product performance**, installation and use guidelines
- For façade system, **apply large scale system testing** and provide clear information about the systems and applications in which their products may be used
- Contribute to **training** of the planners and installers

A European Framework to ensure fire safety in taller buildings

The priority for improvement : quality and compliance

" The fact that serious fire accidents in the EU (Bucharest disco, Grenfell tower) were caused by non-compliance with existing fire regulations points rather at the need to enforce existing Member States regulations than at the need for new regulations at EU level. "

Fulvia Raffaelli,
European Commission DG GROW
Head of unit
European Parliament, 28 November 2018

Source: Quote extracted from presentation, slide 3 full presentation : https://www.modernbuildingalliance.eu/assets/uploads/2018/11/DG-Grow_presentation.pdf

How to ensure Quality & Compliance?

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Ensuring quality and compliance?

"If you wanted to have brain surgery, you would go to a highly qualified neurosurgeon, because you know that it is an incredibly complex problem. (…), fire safety is also an incredibly complex problem. Therefore, it requires an equal level of competence, and we cannot ignore that by putting in place all sorts of other measures [e.g. banning combustible materials] to try to cover the fact that we do not have the skills that would enable us to design buildings of that level of complexity."

Professor José Torero, University College London

Scottish Parliament, 20 November 2019

Source: Official Report of Local Government and Communities Committee meeting on Building Regulations and Fire Safety in Scotland of 20 November 2019
https://archive2021.parliament.scot/parliamentarybusiness/report.aspx?r=12382&mode=pdf

Ensuring quality and compliance?

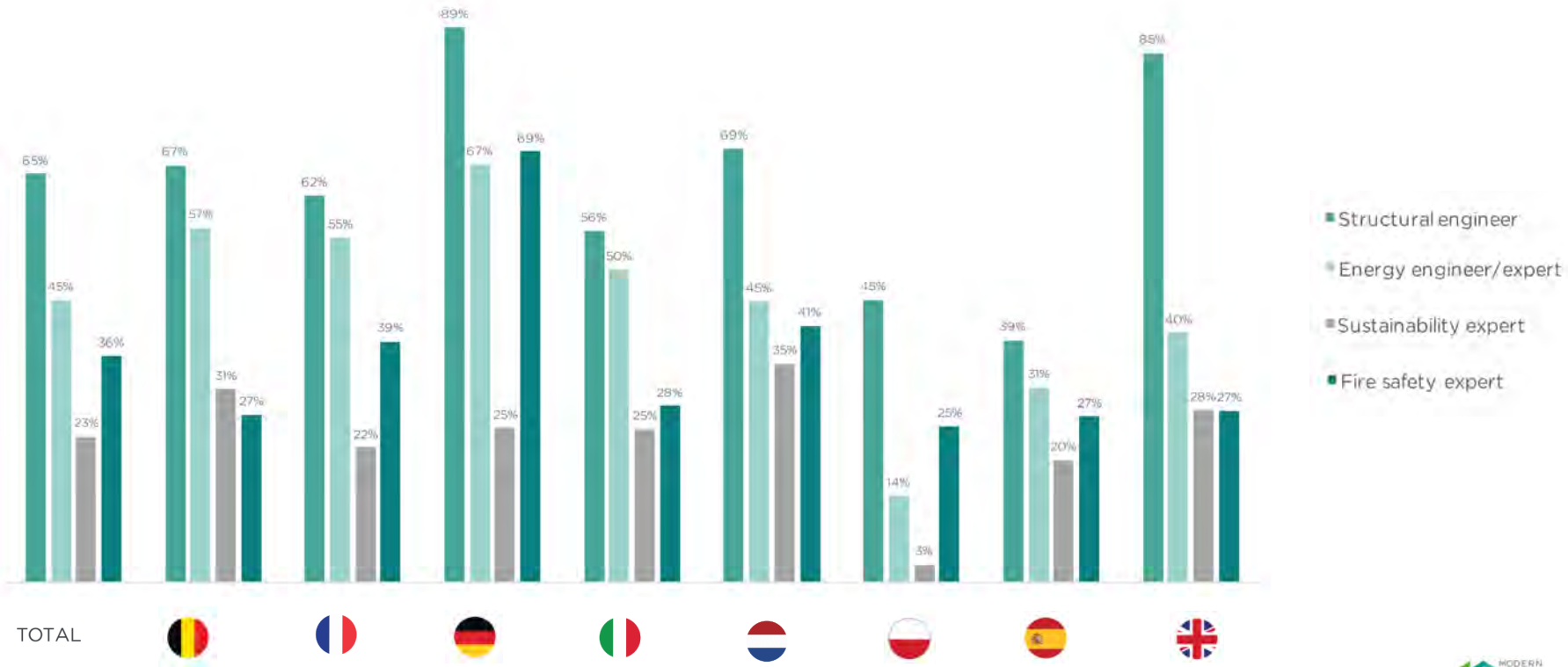
Developing fire safety knowledge and competencies is a necessity, in particular to ensure that fire safety adequately accompanies the sustainable transformation of the building stock

ARCHITECT SURVEY ON FIRE SAFETY COMPETENCY

Source: https://www.modernbuildingalliance.eu/assets/uploads/2020/11/ArchitectsSurvey_on_Fire_Safety_Competency.pdf

Ensuring quality and compliance?

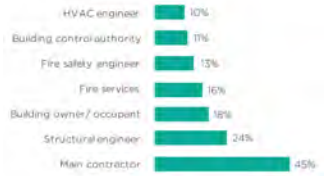
In what percentage of your projects are the following experts involved during the design?



Ensuring quality and compliance?

Which other parties besides yourself has any responsibility for the fire safety of the final building?

BELGIUM



FRANCE

GERMANY

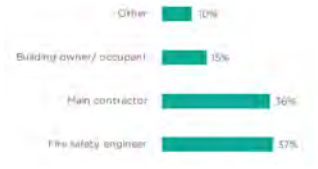
ITALY

Parties named by at least

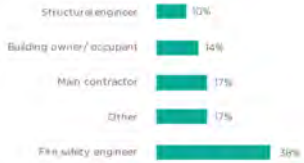
10%

of architects

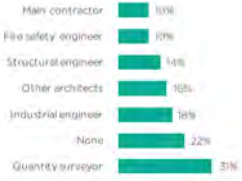
THE NETHERLANDS



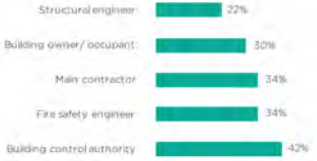
POLAND



SPAIN

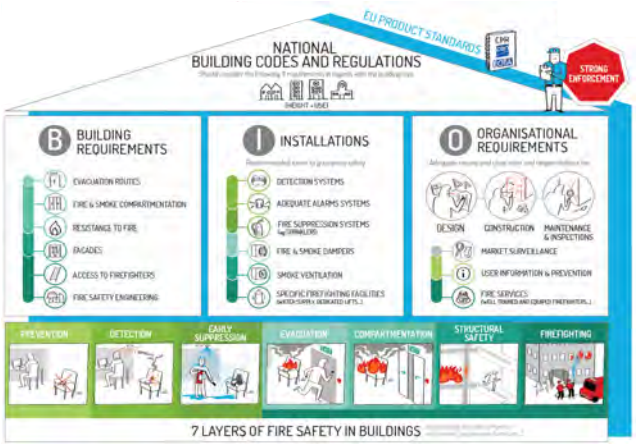


UK



Conclusion: How to ensure fire safe taller buildings?

- A **holistic approach** to fire safety in buildings is necessary
- Fire safety regulation remain a national competence in the EU, but **exchanging information and learnings** can be highly beneficial
- **Structuring the key aspects to be considered** into a common framework can facilitate the exchange of information
- For façades, **large scale test must be the basis**, regardless of combustibility of individual components
- **Ensuring strict enforcement** of existing regulations and standards is essential, including **inspections and maintenance** in existing buildings
- Developing fire safety **knowledge and competencies** to ensure that fire safety adequately accompanies the sustainable transformation of the building stock



Thank you!
Visit colleagues from the
Australian Modern Building Alliance at the
Stand 311