

FACADES AND FIRE

The Essential Elements

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Learning Objectives

At the end of this program, participants will be able to:

- appreciate the principles of the following topics, as they pertain to facades.

1. Reaction to fire versus fire resistance
2. The requirement for full fire resistance and glass types
3. Perimeter fire stopping
4. Reaction to fire – flame spread



■ Fire Resistance versus Reaction to Fire

■ Reaction to Fire

- Reaction to fire tests tend to be small-scale test methods on materials, evaluating – ignitability, flame spread, heat release, smoke development and toxicity.
- Samples tend to be small in size (mm rather than m) and relate to the development stages of a fire.

■ Fire Resistance

- These tests are generally used to determine the fire resistance of complete systems (eg. a wall, ceiling, floor structure, jet fan, fire damper, ducting etc). Specimens tend to be large in size (m rather than mm).
- They generally evaluate the duration of time that a complete structure will hold back a fire (eg. how long a fire will take before breaking into the adjacent room). Fire resistance tests integrity, and/or insulation and/or load bearing capacity (all measured in minutes)
- It relates to performance in a fully developed fire.

■ The Requirement for Full Fire Resistance

- Full fire resistance is mainly required where there is a specific need to:
 - protect the inside space from an external fire (eg. where adjacent buildings are close, or there is another defined and elevated risk)
 - protect the outside space from an internal fire (eg. if the adjacent external space forms an escape corridor)
- Most modern buildings don't need a façade with full fire resistance because buildings can be spaced apart sufficiently
- Fire resistance becomes more focussed on internal partitioning
- Several glass types are available, with differing characteristics

■ Perimeter Firestopping

- This is an important fire resistance element that is required normally – preventing vertical flame spread
- It has historically been poorly provided and needs full integration with the wall

■ Reaction to Fire – Flame Spread

- Flame spread on an exterior wall must be understood and controlled
- A wall doesn't have to have a full fire resistance performance to do that (although perimeter firestopping is likely to be a requirement)
- Both components and the full system should be evaluated (in that order)
- It is important to understand the performance of all parts of composite materials, eg. the core of a composite panel
- Appropriate test standards are proposed
- Performance criteria are proposed and should be developed for local application

■ **Andy Dean – Head of Façade Engineering – WSP ME**

- Andy has over 25 years of experience in the field of building and construction, ranging from structural testing within the nuclear industry to fire testing. Having established the Dubai Cladding Technology Centre and Laboratory, and operated it for 10 years, he has particular knowledge of heavy structures testing and weathertightness testing of cladding, curtain walling and building envelope systems.
- He has carried out many consultancy projects as a third-party specialist in the field of building envelope technology.
- With long-standing association with the CIOB, Andy is an MCIOB, committee officer and a professional review mentor.
- He is a Fellow of the CIBSE Society of Facade Engineers and an active committee member and chair within the Middle East Chapter of the Glass and Glazing Federation (GGF).
- He continues to provide input into the UAE code and is a regular speaker at industry technical seminars.



REACTION TO FIRE VERSUS FIRE RESISTANCE

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REACTION TO FIRE VERSUS FIRE RESISTANCE

REACTION TO FIRE

- Usually materials
- Fire development
- Various measurement formats
- Ignitability
- Surface spread of flame
- Smoke development
- Toxicity
- Combustibility



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REACTION TO FIRE TESTING (1)



Source: Exova Warringtonfire

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REACTION TO FIRE TESTING (2)



Source: Exova Warringtonfire

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REACTION TO FIRE TESTING (3)



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REACTION TO FIRE TESTING (4)



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REACTION TO FIRE TESTING (5)



Source: Exova Warringtonfire

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REACTION TO FIRE VERSUS FIRE RESISTANCE

FIRE RESISTANCE

- Usually systems
- Preventing a fully-developed fire from getting from one compartment into an adjacent one
- Compartmentation – internal fire spread
- Walls, doors, windows, floors, ceilings, penetration seals
- Measured in time (temperature, integrity, structural)



WE ARE WSP FIRE RESISTANCE TESTING (1)



Source: Exova Warringtonfire

WE ARE WSP FIRE RESISTANCE TESTING (2)



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FIRE RESISTANCE TESTING (3)



Source: Exova Warringtonfire

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Source: Exova Warringtonfire

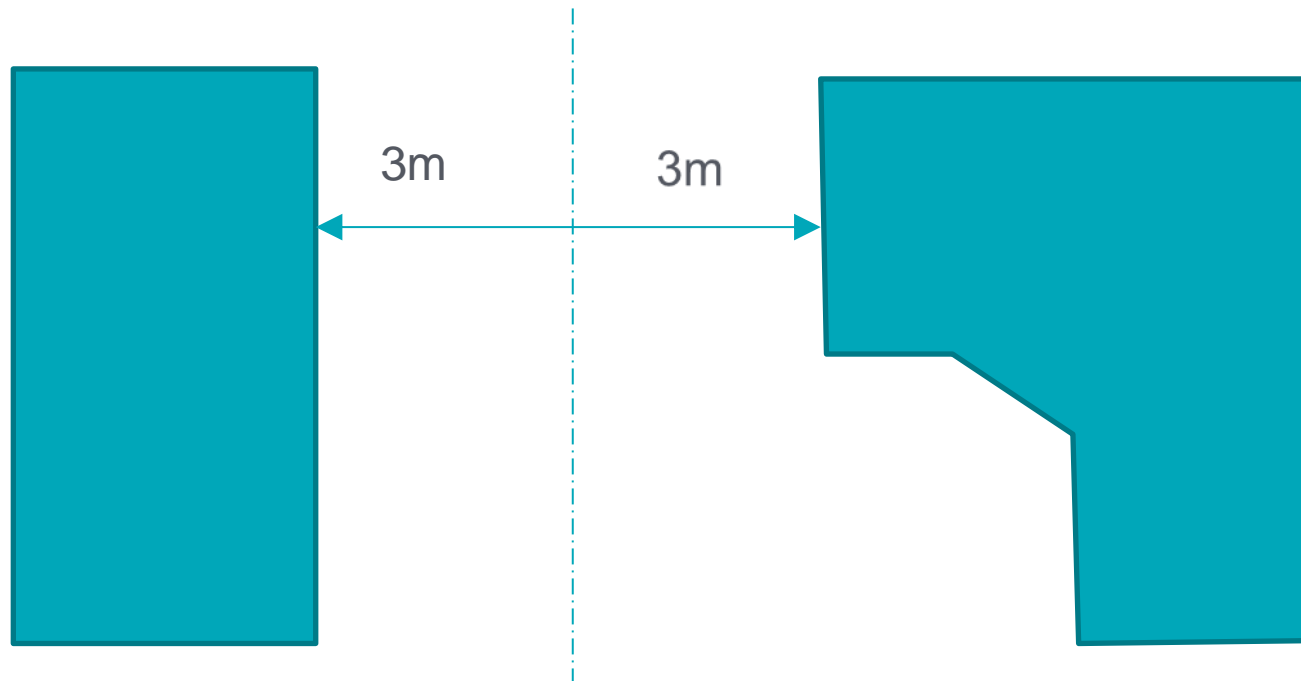


THE REQUIREMENT FOR FULL FIRE RESISTANCE IN FACADES

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THE REQUIREMENT FOR FULL FIRE RESISTANCE - FACADES

- Preventing flame spread out of, or into, a building
- Protecting an essential space



- More frequently an internal requirement (internal partitions)

CODE REQUIREMENTS – Regional Examples

- UAE Fire and Life Safety Code
- Qatar Civil Defence Fire Safety Standards
- NFPA 5000
- Should be tested and certified
- ASTM E119
- BS 476
- EN 1364 Part 3

Classifications

- E Integrity only
- EW Integrity with radiation limitation
- EI Integrity with insulation

Main Types (1)

- **Wired**
E30, safety glass, double glazed, can be sprayed, multi-directional, clear or opaque
- **Tempered borosilicate**
E120, safety glass, double glazed, multi-directional, no wires
- **Ceramic**
E240, can be safety glass, double glazed, can be sprayed, no wires
- **Light-weight laminated**
E60 or EW60, safety glass, double glazed, multi-directional, no wires
- **Modified tempered soda lime silicate**
E60 or EW30/60, safety glass, double glazed, no wires

Main Types (2)

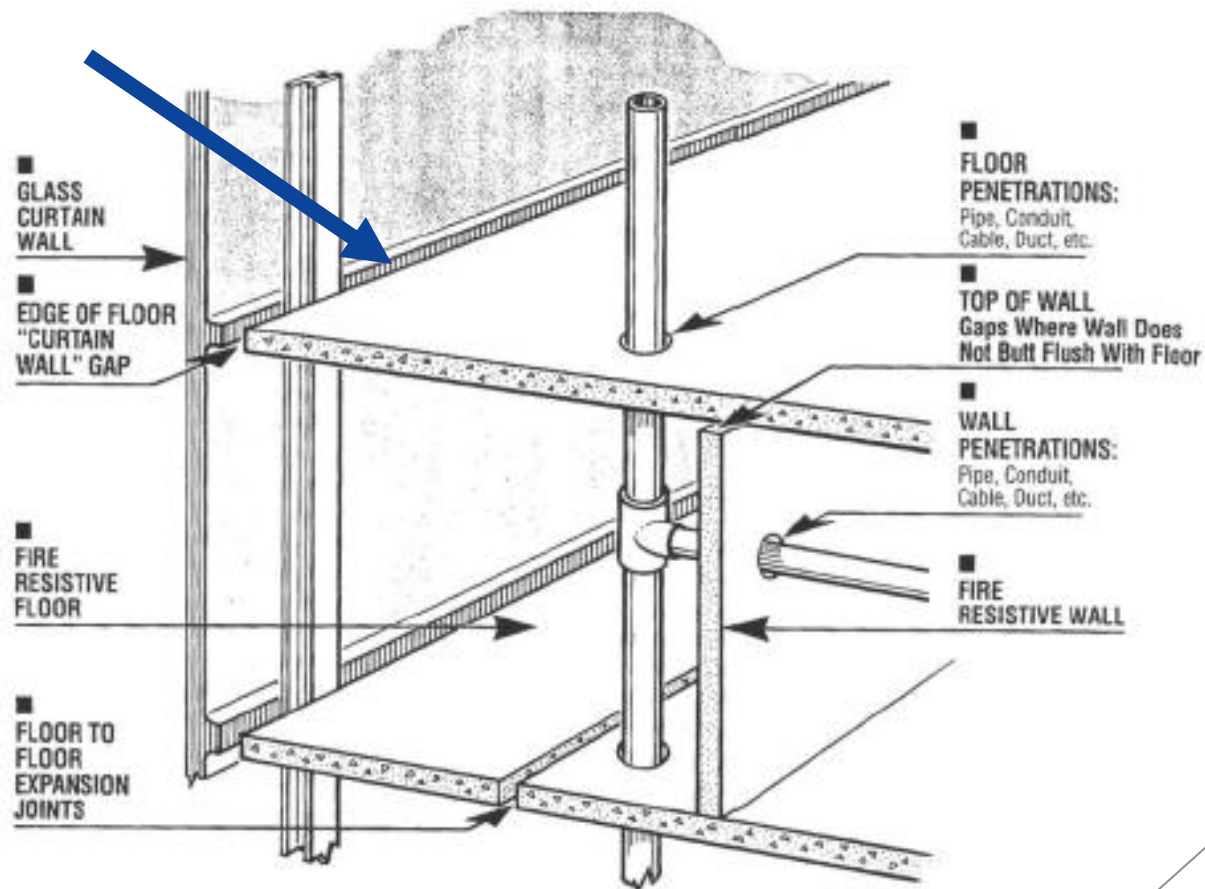
- **Resin & PVB laminated**
E60 or EW30/60, safety glass, double glazed, multi-directional, no wires
- **Intumescent & gel laminated**
EI 120, safety glass, double glazed, can be sprayed, multi-directional
- **Points to consider**
Expense, lead times, thicknesses, weight, sprayable? (collapse), insulation, multi-directional, colour



PERIMETER FIRESTOPPING

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- The joint between the slab edge and the façade.



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PERIMETER FIRESTOPPING

- Purpose – to prevent vertical fire spread through this joint
- Requirement – to maintain internal fire spread performance rating up to the façade

CODE REQUIREMENTS – Regional Examples

- UAE Fire and Life Safety Code
- Qatar Civil Defence Fire Safety Standards
- NFPA 5000
- Should be tested and certified
- ASTM E2307
- EN 1364 Part 3 (full) or Part 4 (part configuration)



REACTION TO FIRE AND FACADES

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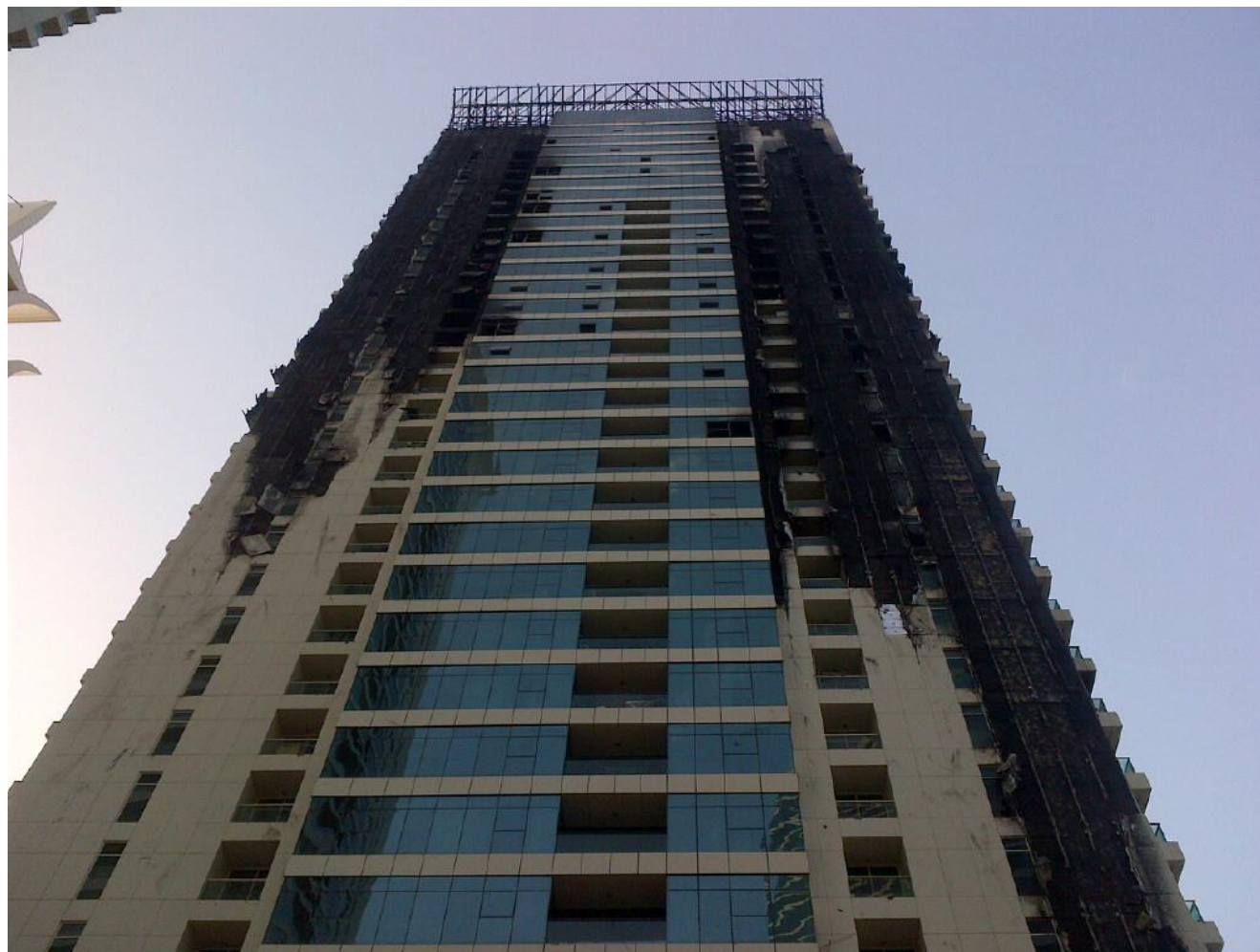


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- **Non-combustible?**
 - Unrealistic
 - Components only

- **Ignitability?**
 - Probably

- **Spread of flame?**
 - Definitely

SPREAD OF FLAME – COMPONENTS

- **Component examples**

- insulation
- sealants
- coatings
- panels (aluminium composite panelling – ACP)

- **Components require small scale tests**

- BS 476 part 7, ASTM E84, EN 13501-1

SPREAD OF FLAME – THE SYSTEM

- **System**

- full scale test

- BS 8414, NFPA 285, ISO 13785, several others

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BS 8414

- Fire rated system after 15 minutes



Source:
Exova
Warringtonfire

- **Non-fire rated system after 15 minutes**



Source:
Exova
Warringtonfire

SPREAD OF FLAME – THE SYSTEM

- **System**
 - full scale test
 - BS 8414, NFPA 285, ISO 13785, several others
- **Performance criteria proposed in LPS 1582**

- Fire resistance versus reaction to fire – context
- The requirement for fire resistance – uncommon
- Perimeter firestopping – integral with the façade
- Reaction to fire – flame spread – locally relevant



THANK YOU

