

FIRE TESTING FAÇADE

Systems and Materials

16th April 2024

Sreenivas Narayanan
Global Partnerships Director

**GO
BEYOND**[®]

Tall Buildings
fire safety network



Thank You, Firefighters!



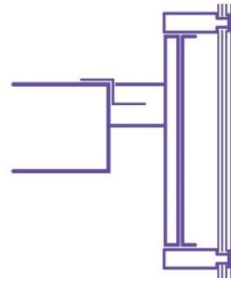
Expressing gratitude for the bravery and sacrifices of firefighters.

For putting your lives on the line to protect the communities. We appreciate their hard work and dedication to keeping us safe.

Fires in the US - Year 2022

	Fires	Deaths	Injuries	Property Loss (Millions)
Apartment or other multi-family housing	80,000	470	2750	\$1,911
Non-residential structure fire	140,000	150	1400	\$4,068

<https://www.nfpa.org/education-and-research/research/nfpa-research/fire-statistical-reports/fire-loss-in-the-united-states>



WHY PASSIVE PROTECTION? CHALLENGES?



“We have always done it this way.”



WHY PASSIVE PROTECTION? CHALLENGES?



We can do right
only once!



The ESG strategy is set around science-based targets and is embedded throughout the business



Planet



Energy & Emissions

Employee car fleet already >2/3 EV



Resource Circularity

Recycle all waste stonewool back to source



Ecology & Biodiversity

Adhesive line in Hadleigh becoming non-solvent



People



Skills

Invest heavily in staff training with our own in-house training centre



Diversity & Equality

Diverse management team, both in UK and overseas branches – gender and ethnicity



Health & Safety

Mind Health Gold award



Prosperity



Economic Contribution

Successful, profitable business which remunerates staff well for local area



Social Contribution

Siderise Community Trust – funding for local projects



Research & Development

Built own R&D centre – enabling the expediting of fire testing



Governance



Risk & Opportunity

Thorough, regular reporting regime



Ethical Behaviour

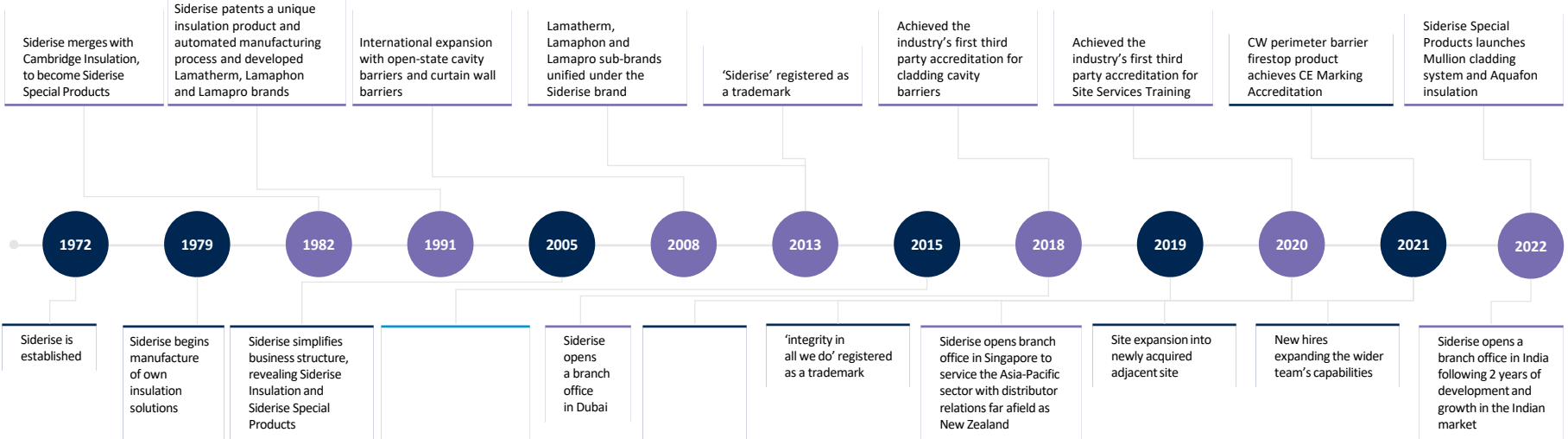
Values are lived and breathed by all



Purpose & Composition

Mission, Vision and Values at heart of business

History and Group structure



People and Ops.

Accreditations

certifire, Intertek, CE, Institute of Acoustics sponsoring organisation, BBA, Indian Government emblem, UL, NVHBC, SGS, Intertek

Comprehensive proposition

Full suite of unique certified products, Technical Services and Site Services

Products

- Unique product design and manufacture
- Critical fire safety applications
- Fully certified products
- Specialist acoustic solutions

Value-add free of charge services

- End-to-end services
- Differentiated to competitors
- Provides reassurance and ensures quality

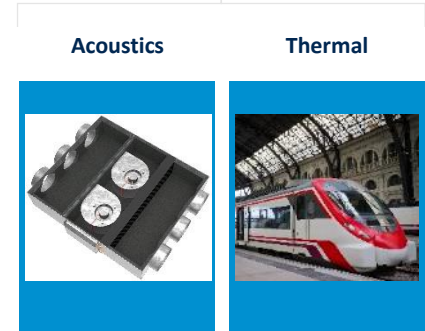
Proactive drive for industry betterment

- Driving improved competence, skills, knowledge and behaviour

Siderise Insulation



Siderise Special Products



Site Services



Technical Services



Reaction To Fire



Fire Resistance

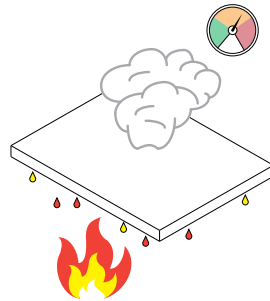


Terminology and Definitions

Reaction To Fire

- European Classifications: EN13501-1

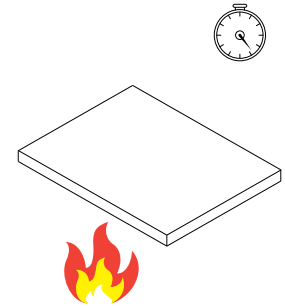
“Reaction to Fire. Response of a product in contributing by its own decomposition to a fire to which it is exposed, under specified conditions.” – EN13501-1, 3.1.15



Fire Resistance

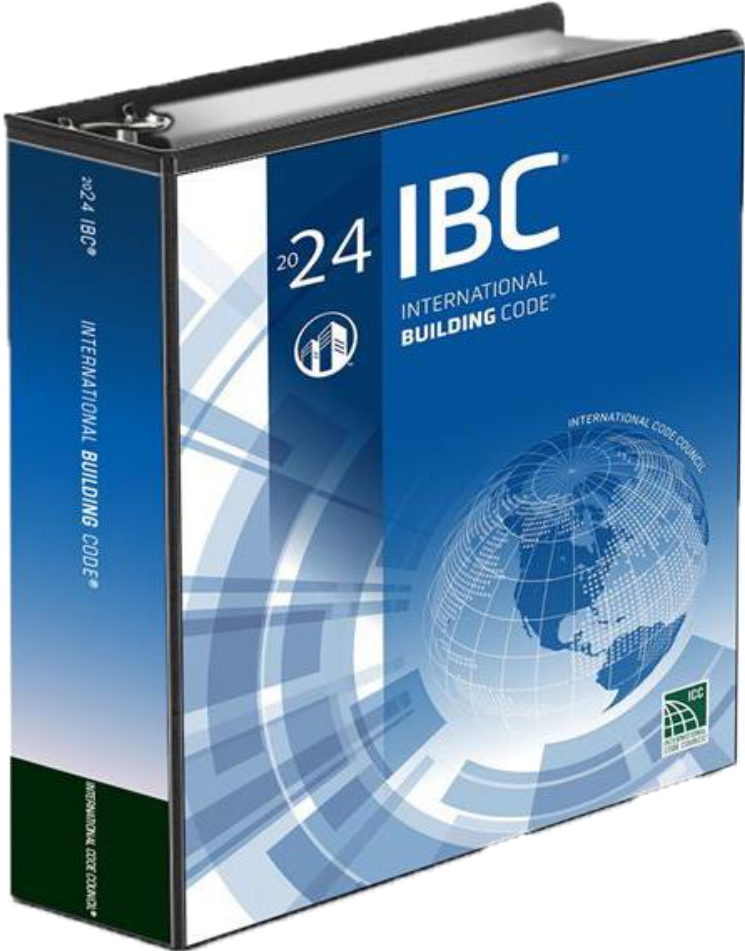
- Ratings: EN13501-2

“Fire resisting (Fire resistance) The ability of a component or a building to satisfy, for a stated period of time, some or all of the appropriate criteria given in the relevant standard.” – ADB Vol2 appendix A



Why we Test?

Legal requirements	
Testing to specified standards at approved labs	
Certification by approved labs	
<u>C.O.C AS PER SYSTEM SPECIFICATION</u>	
Compliant	Test standard
	System assembly
	Audited products

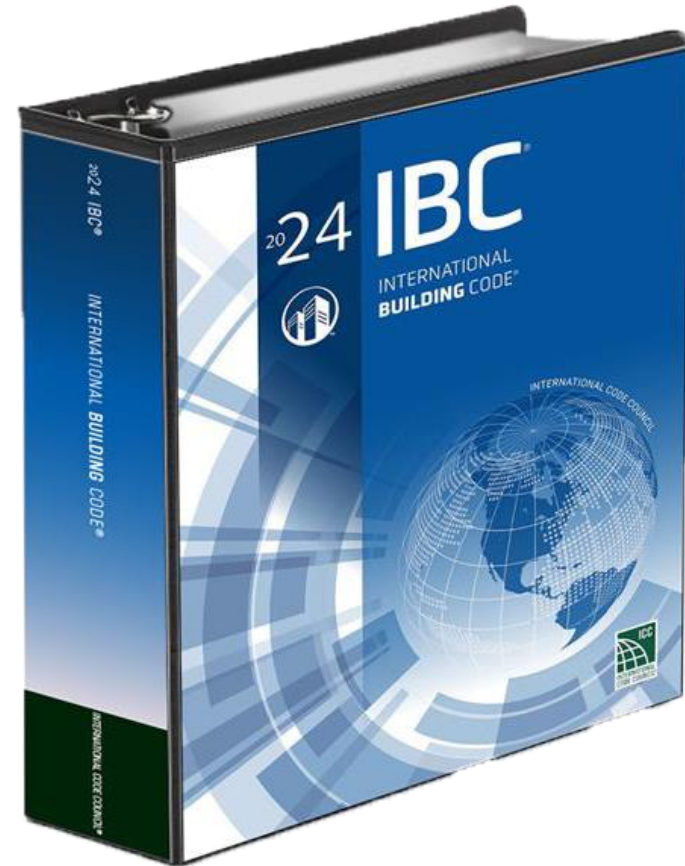


Why we Test?

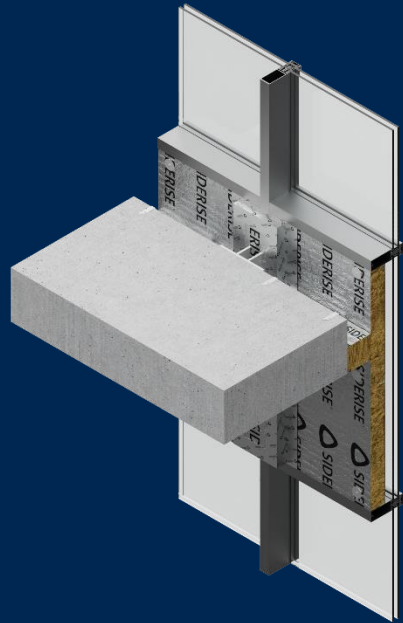
715.3.1 Fire test criteria. *Fire-resistant joint systems* shall be tested in accordance with the requirements of either ASTM E1966 or UL 2079. Nonsymmetrical wall joint systems shall be tested with both faces exposed to the furnace, and the assigned *fire-resistance rating* shall be the shortest duration obtained from the two tests. Where evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the *building official*, the wall need not be subjected to tests from the opposite side.

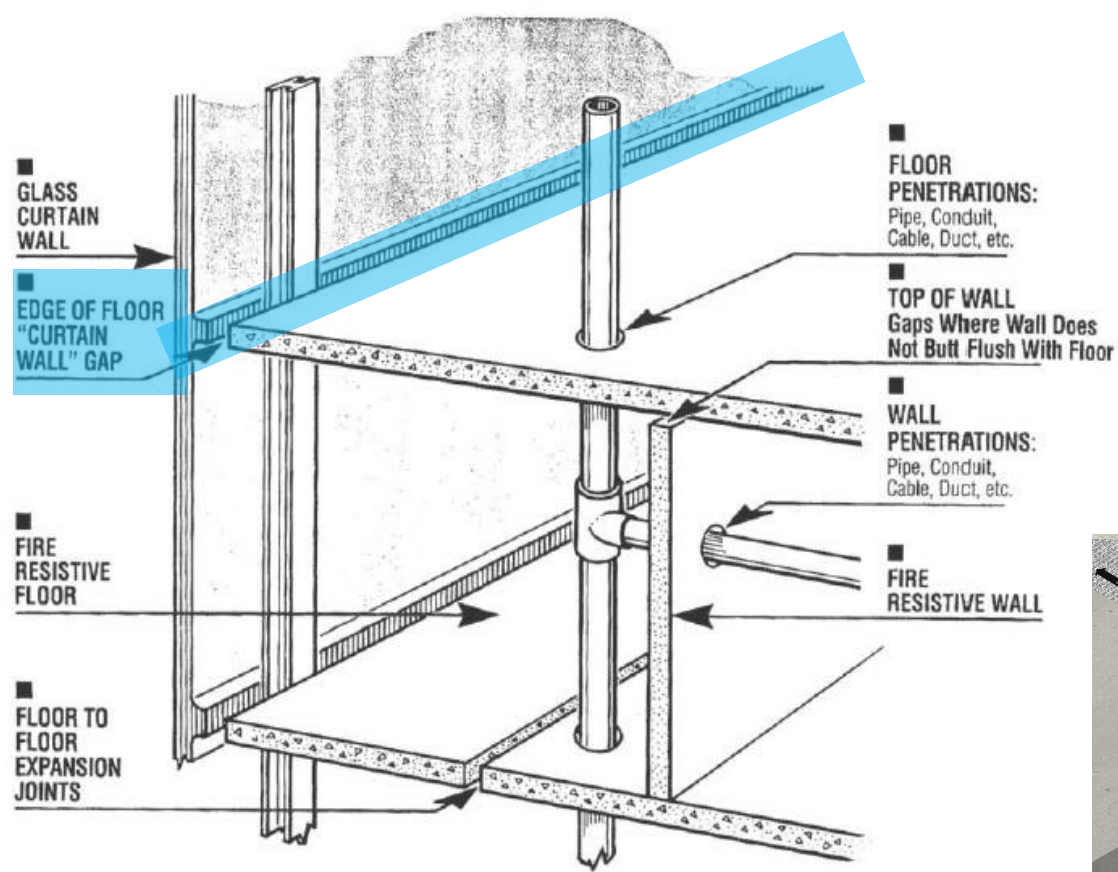
715.4 Exterior curtain wall/fire-resistance-rated floor intersections. Voids created at the intersection of exterior curtain wall assemblies and fire-resistance-rated floor or floor/ceiling assemblies shall be protected with an *approved perimeter fire containment system* to prevent the interior spread of fire. Such systems shall provide an *F rating* for a time period not less than the *fire-resistance rating* of the floor or floor/ceiling assembly.

715.4.1 Fire test criteria. *Perimeter fire containment systems* shall be tested in accordance with the requirements of ASTM E2307.

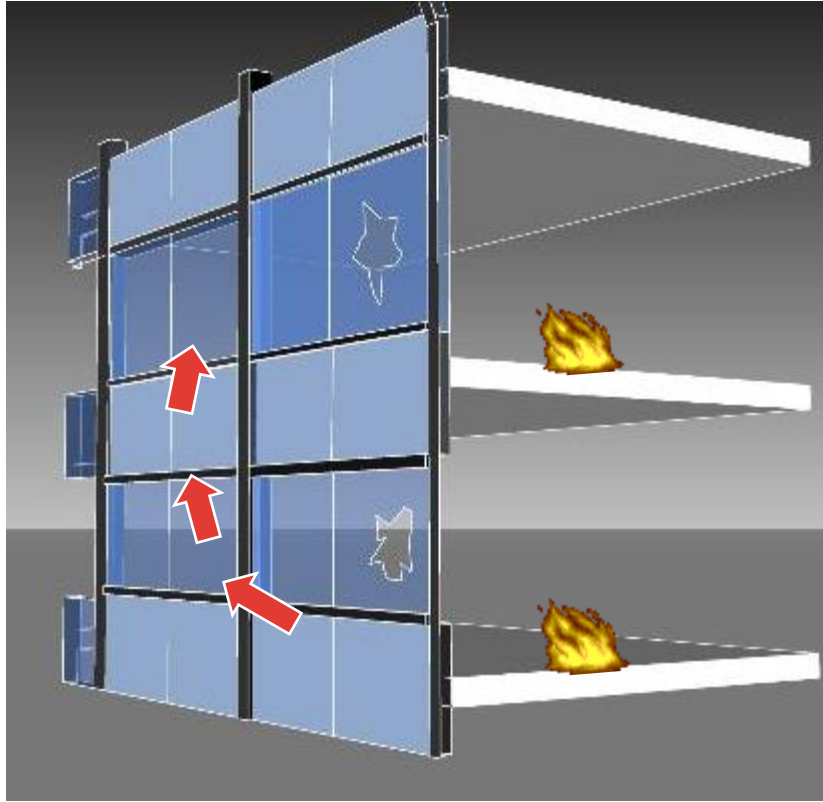


Curtain Walling

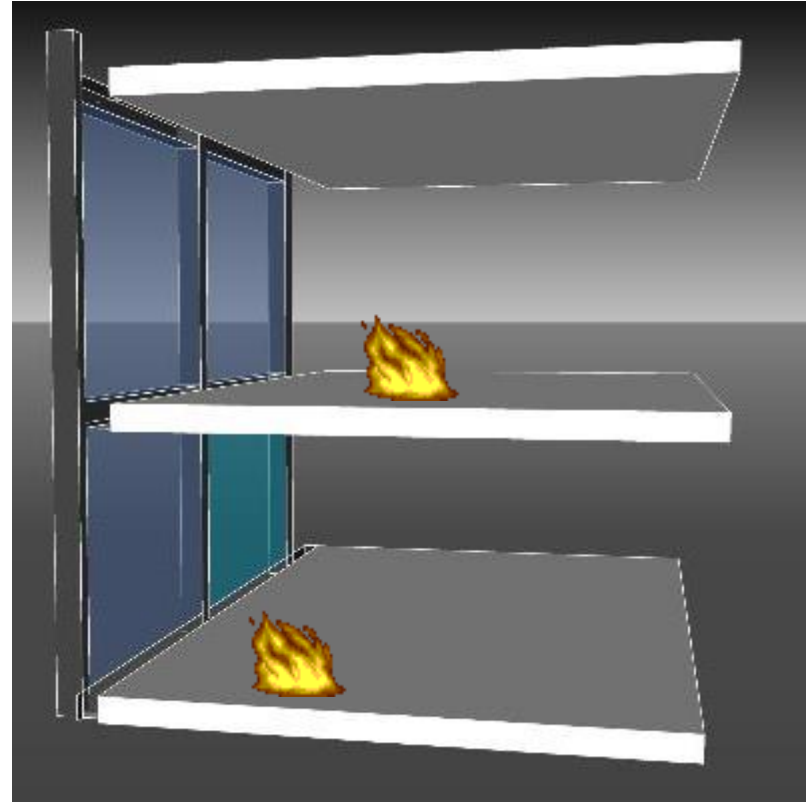




Functional Performance Requirements of Fire Stops



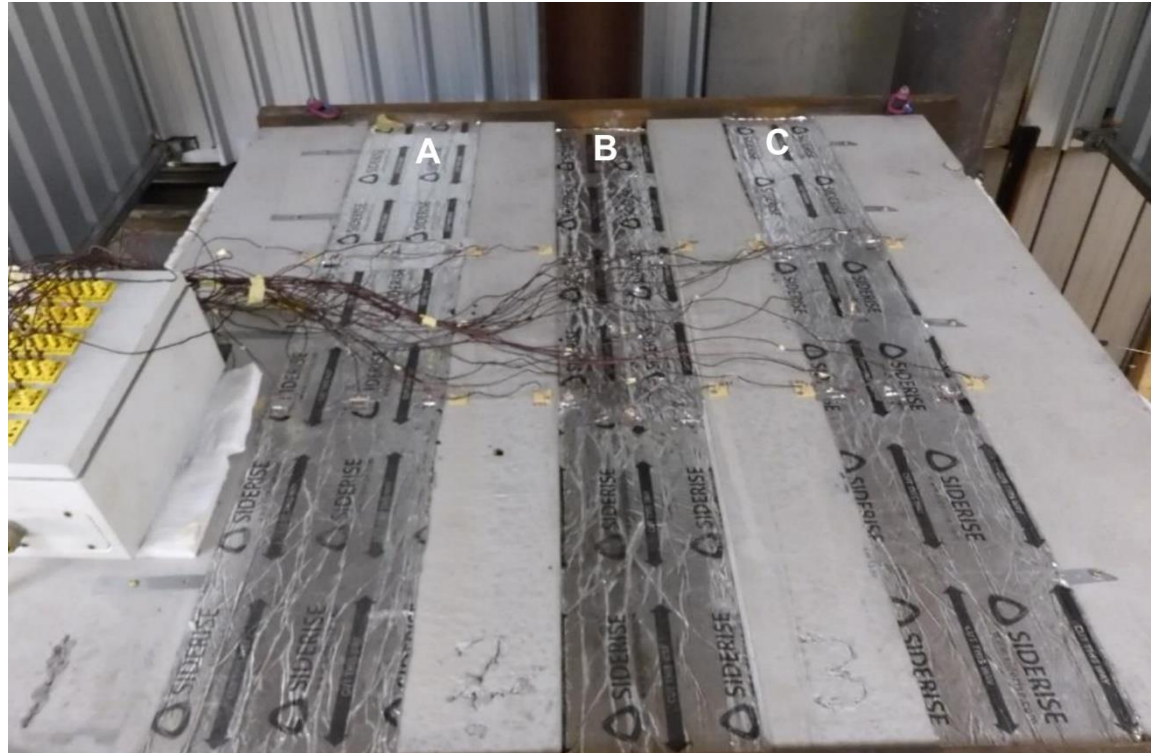
LEAP-FROG EFFECT



INTERNAL SPREAD OF FIRE

WHAT ISO834.4, BS 476 Part 20, EN 1366-4 / 4, UL 2079

- Resistance to fire
- Similar time temperature curve
- Control / Linear joint test
- Application – floor to floor
- Limited to 1m or 1.2 m in length
- Curtain wall?
- Movement criteria?



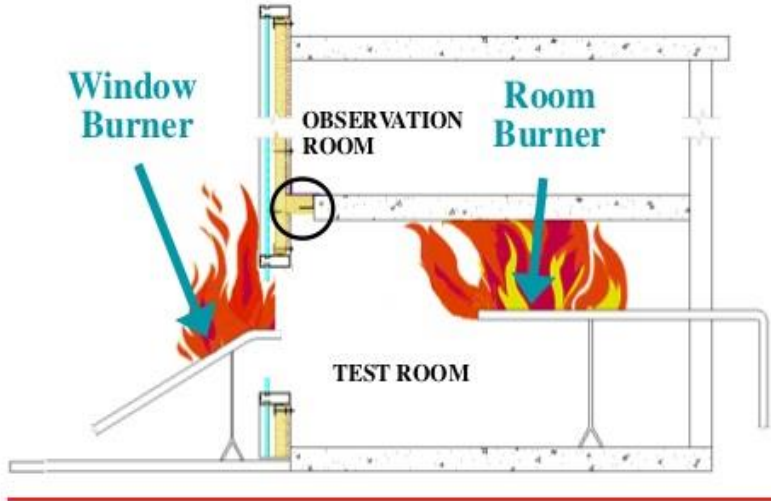
ASTM E2307



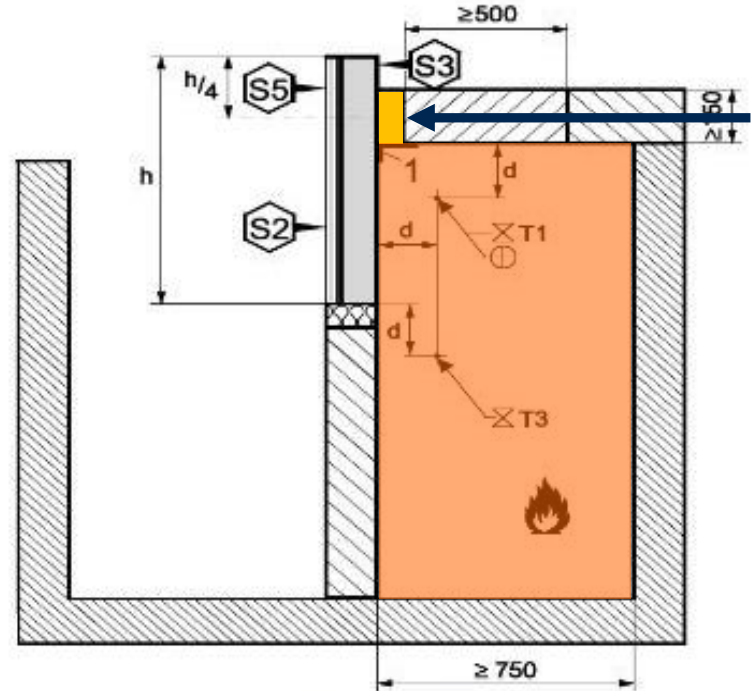
EN 1364-4



ASTM E 2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using the Intermediate-Scale Multi-story Test Apparatus



Intermediate Scale Multi-story Test Apparatus



ASTM 2307

PRE TEST →



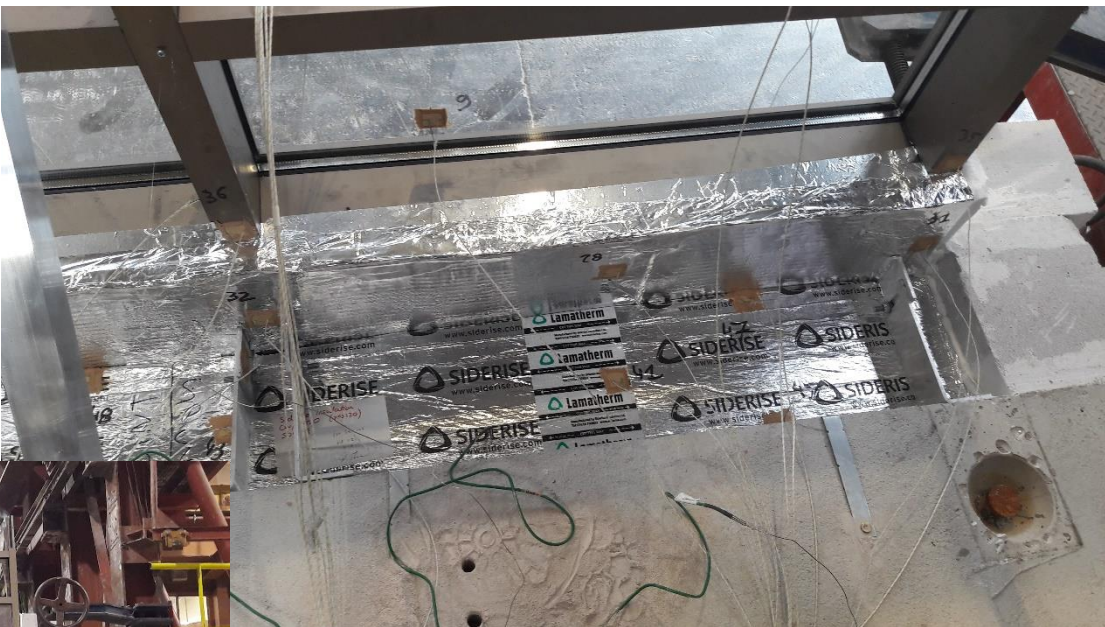
↑
INSIDE VIEW – POST TEST

POST TEST IMAGE - EXTERIOR →



BS EN 1364 Part 4

- Includes Spandrel performance
- Void Size – Minimum and Maximum
- Curtain wall system design
- Certification and Documents available for verification at any point in the future



↑
PRE-TEST

← EXTERNAL VIEW – POST TEST

MOVEMENT / PRE CYCLING

ASTM E 2307

- Refers to the following table within the standard for pre-cycling (cold) movement

TABLE 3 Conditions of Test Specimen Cycling

Movement Type	Minimum Cycling Rates (cpm)	Minimum Number of Movement Cycles
Thermal	1	500
Wind Sway	10	500
Seismic	30	100
Combined	30	100
	10	400

followed by:

EN 1364 - 4

- Refers to ETAG 026 which is now replaced by EAD 350141-00-1106

2.2.14 Cycling of perimeter seals for curtain walls

The test construction shall be subject to cycling a minimum of 500 times between the minimum and maximum joint width corresponding to the movement capability for a certain nominal joint width. Cycling shall start at the nominal joint width and finish at the maximum joint width. Cyclic rates of 30 cpm (cycles per minute) shall be designated as seismic, cyclic rates of 10 cpm shall be designated wind sway, and those rates below 1 cpm shall be designated thermal. The applicant shall designate a cyclic rate that shall be recorded in the test report.

After cycling, the test construction shall be allowed to stabilise for 24 hours, without alteration before fire testing, if not, the reasons shall be stated in the report.

Joint seals tested at a higher frequency are deemed to perform at lower frequencies.

Compression set data shall be provided on test specimens relying solely upon compression for placement in joints to satisfy long term performance.

The resistance against movement is given as "cycle tested at 30 cpm", "cycle tested at 10 cpm", or "cycle tested at 1 cpm".

Functional Performance Requirements of Fire Stops





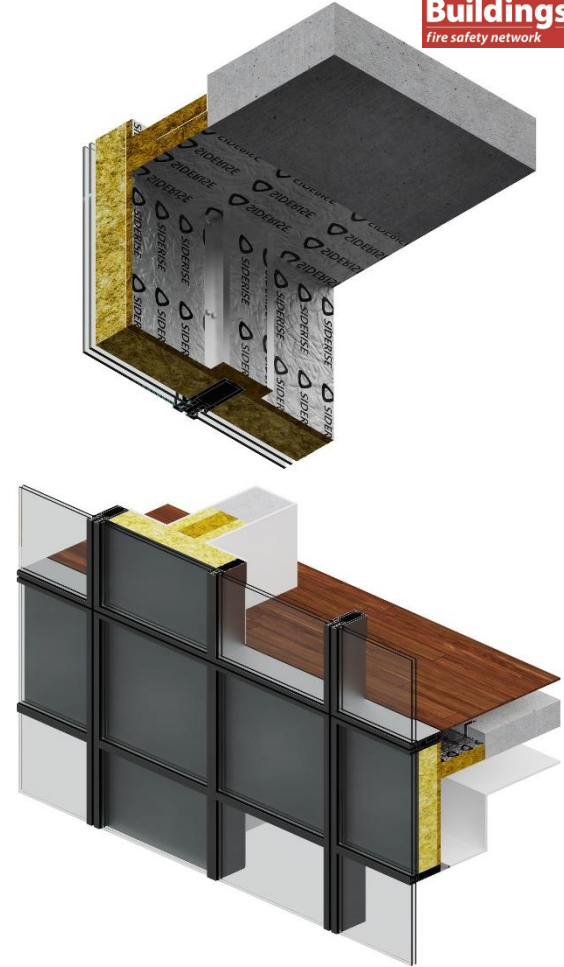
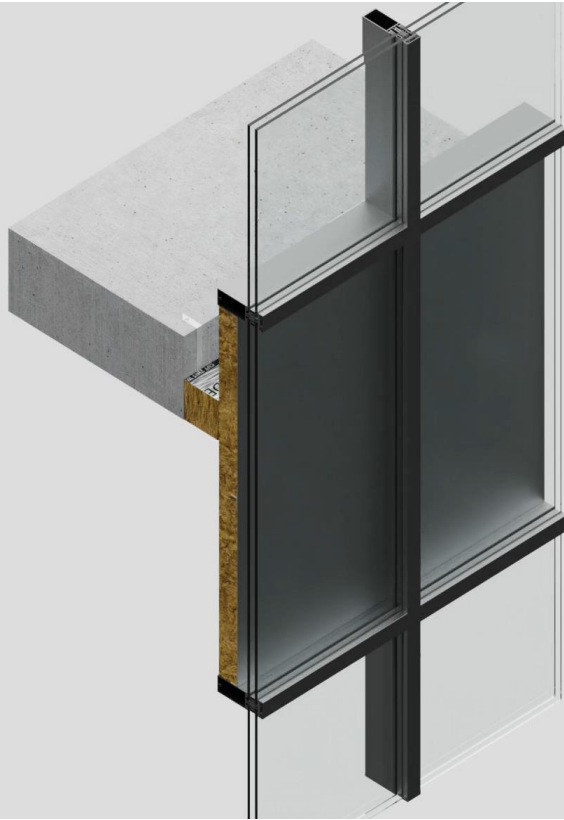
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6



6

SYSTEM Approach



CODE REQUIREMENT

4.5.9. Openings on the exterior walls



- 4.5.9.1.** Openings on exterior walls in adjacent stories shall be separated vertically to protect against fire spread on the exterior of the buildings where the openings are within 1524 mm of each other horizontally. Such openings shall be separated vertically not less than 914 mm by spandrel girders, exterior walls or other similar assemblies that have a fire-resistance rating of not less than 1 hour, rated for exposure to fire from both sides, or by flame barriers that extend horizontally not less than 762 mm beyond the exterior wall. Flame barriers shall have a fire resistance rating of not less than 1 hour.
- 4.5.9.2.** Where a Spandrel Panel is used to satisfy the requirement in **Section 4.5.9.1.**, it shall be ensured that the materials used and spandrel panel as system provides a minimum of 60 minutes fire resistance from BOTH sides of the panel. All transoms and Mullions must be protected in this respect.
- 4.5.9.3.** Fire safing forming the perimeter edge protection must ensure the same performance as the structural floor slab in respect of F and T ratings.
- 4.5.9.3.** Aluminium Back Pans shall not be accepted.

Vertical Separation – 915mm

705.8.3 Unprotected openings. Where unprotected openings are permitted, windows and doors shall be constructed of any *approved* materials. Glazing shall conform to the requirements of Chapters 24 and 26.

705.8.4 Mixed openings. Where both unprotected and protected openings are located in the *exterior wall* in any *story* of a building, the total area of openings shall be determined in accordance with the following:

$$(A_p/a_p) + (A_u/a_u) \leq 1 \quad \text{(Equation 7-2)}$$

A_p = Actual area of protected openings, or the equivalent area of protected openings, A_e (see Section 705.7).

a_p = Allowable area of protected openings.

A_u = Actual area of unprotected openings.

a_u = allowable area of unprotected openings.

705.8.5 Vertical separation of openings. Openings in *exterior walls* in adjacent *stories* shall be separated vertically to protect against fire spread on the exterior of the buildings where the openings are within 5 feet (1524 mm) of each other horizontally and the opening in the lower *story* is not a protected opening with a *fire protection rating* of not less than $3/4$ hour. Such openings shall be separated vertically not less than 3 feet (914 mm) by spandrel girders, *exterior walls* or other similar assemblies that have a *fire-resistance rating* of not less than 1 hour, rated for exposure to fire from both sides, or by flame barriers that extend horizontally not less than 30 inches (762 mm) beyond the *exterior wall*. Flame barriers

shall have a *fire-resistance rating* of not less than 1 hour. The unexposed surface temperature limitations specified in ASTM E119 or UL 263 shall not apply to the flame barriers unless otherwise required by the provisions of this code.

Exceptions:

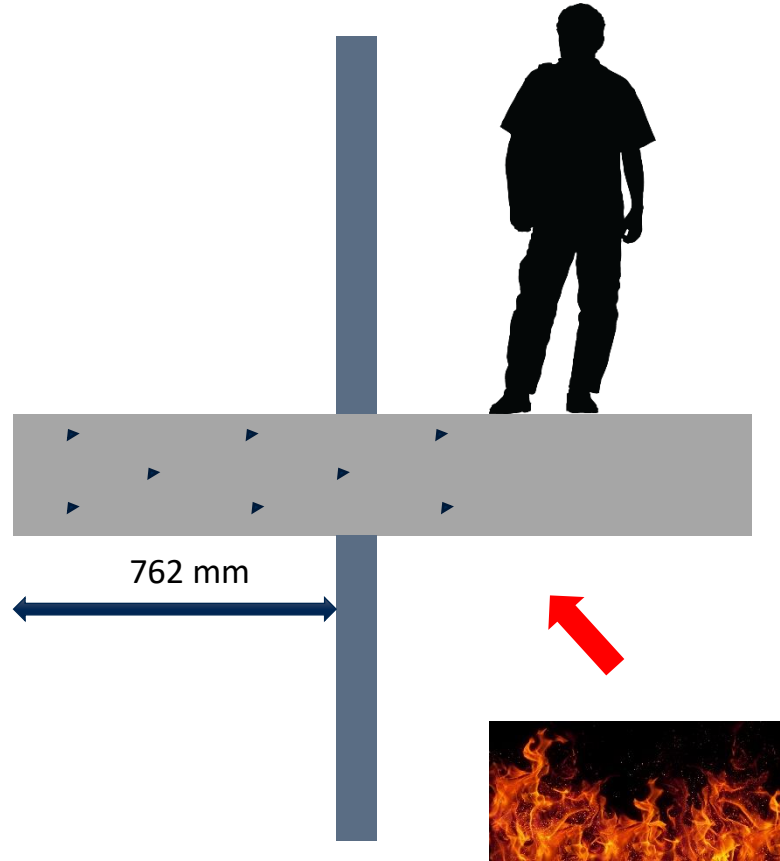
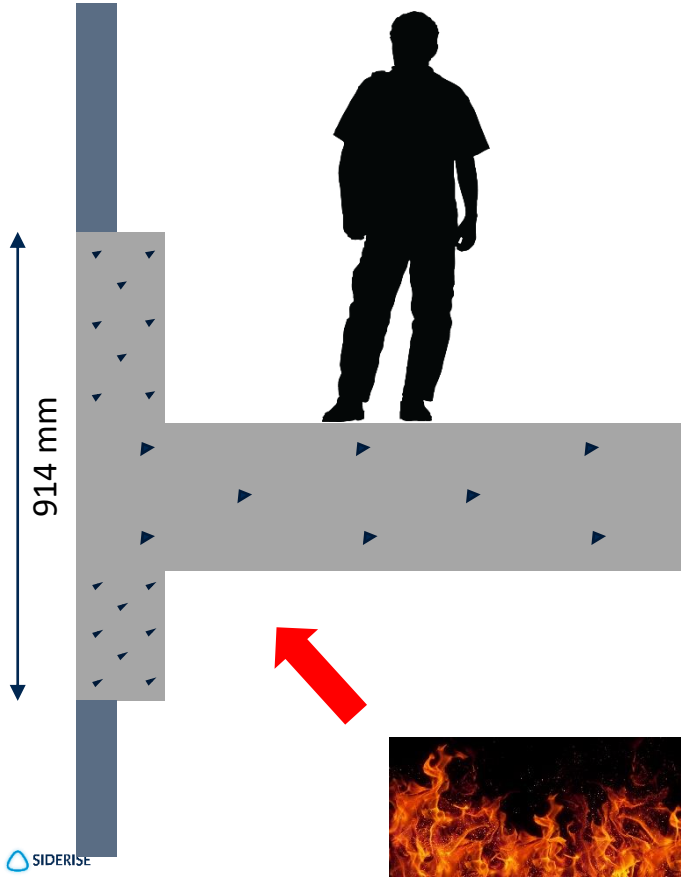
1. This section shall not apply to buildings that are three *stories* or less above *grade plane*.
2. This section shall not apply to buildings equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1 or 903.3.1.2.
3. *Open parking garages*.

705.8.6 Vertical exposure. For buildings on the same lot, opening protectives having a *fire protection rating* of not less than $3/4$ hour shall be provided in every opening that is less than 15 feet (4572 mm) vertically above the roof of an adjacent building or structure based on assuming an imaginary line between them. The opening protectives are required where the *fire separation distances* from the imaginary line to each building or structure are less than 15 feet (4572 mm).

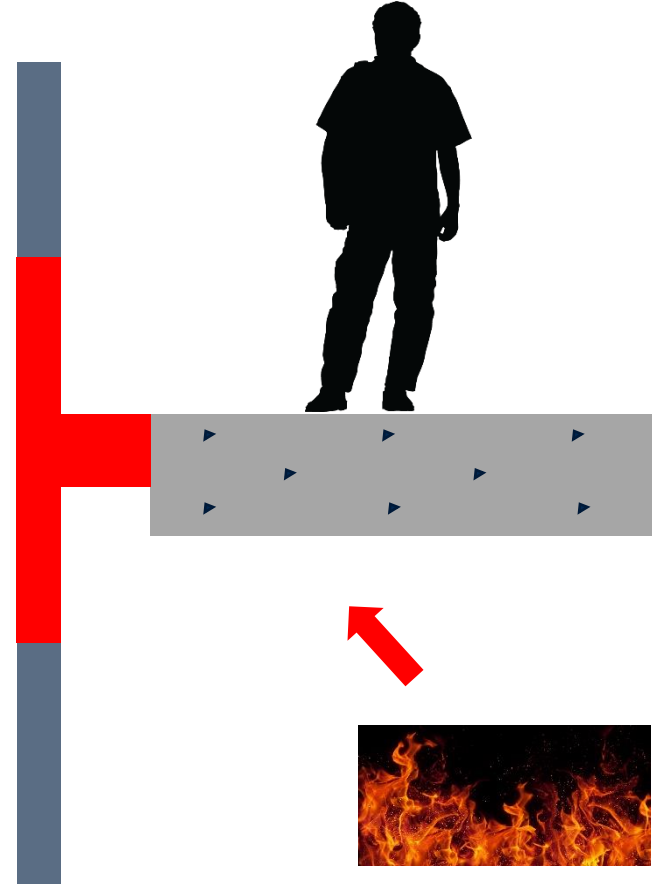
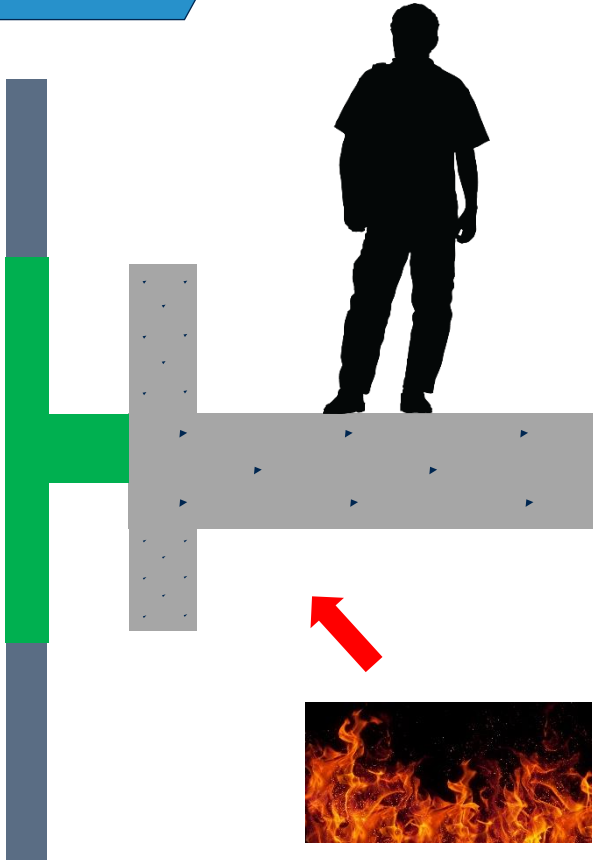
Exceptions:

1. Opening protectives are not required where the *roof assembly* of the adjacent building or structure has a *fire-resistance rating* of not less than 1 hour for a minimum distance of 10 feet (3048

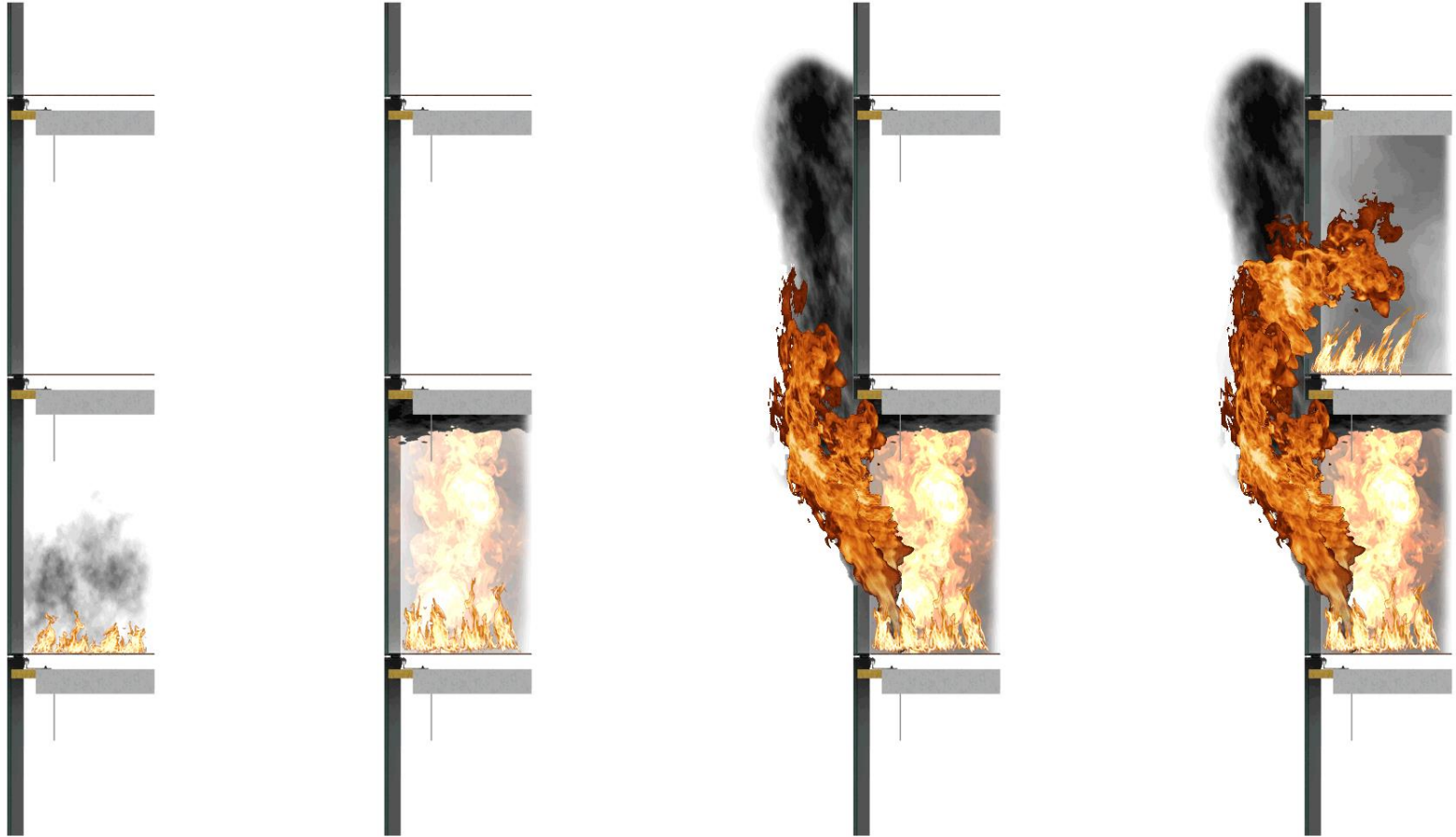
Code Requirement



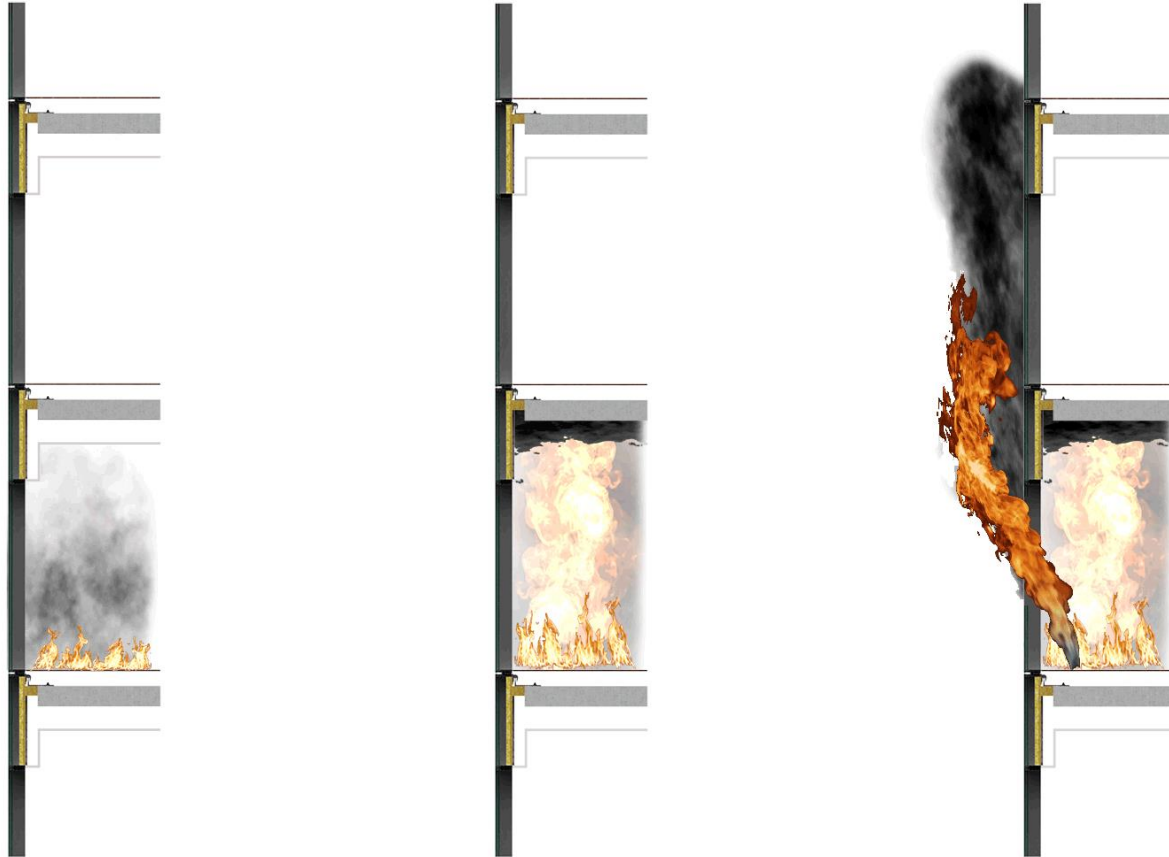
Code Requirement



LET'S DEEP DIVE – SCIENCE BEHIND CURTAIN WALL FIRE CALAMITY



RESULT OF RIGHT SYSTEM..



1. SAFE EVACUATION
2. IMPROVED PERFORMANCE
3. LIMITED BUSINESS INTERRUPTION



CSI: DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
Section: 07 80 00—Fire and Smoke Protection
Section: 07 84 00—Firestopping
Section: 07 84 53—Building Perimeter Firestopping

Product Certification System:

The ICC-ES product-certification system includes evaluating reports of tests of standard manufactured product, prepared by accredited testing laboratories and provided by the listee, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the listee's quality system.

Product: SIDERISE CW-FS120

Listee: SIDERISE INSULATION LIMITED

Evaluation: Siderise CW-FS120 perimeter barriers and firestops for curtain walling comprises of a 120 mm thick one-piece product with a pre-compressed noncombustible stone wool core and integral aluminum foil facing. Siderise CW-FS120 perimeter barriers and firestops for curtain walling were evaluated based on a tested non-load bearing wall assembly consisting of building-material components described in the Design Listings, tested in accordance with the following standards:

- ASTM E2307 (-15BE1 and -10), Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.

Findings: Siderise CW-FS120 perimeter barriers and firestops for curtain walling as components of the assembly is based on testing in accordance with the applicable test method as referenced in each ICC Design No., and as referenced in the applicable sections of the following code editions:

- 2021 *International Building Code®* (IBC)
Applicable Section: 715.4
- 2018 *Saudi Building Code General Requirements* (SBC 201)
Applicable Section: 715.4

Identification:

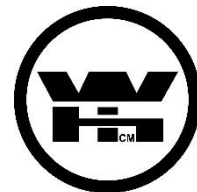
1. The ICC-ES mark of conformity, electronic labeling, the listing report number (ICC-ES [ESL-1524](#)), and when applicable, the ICC-ES Listing Mark, along with the name, registered trademark, or registered logo of the listee must be included in the product label.
2. In addition, Siderise CW-FS120 perimeter barriers and firestops for curtain walling are identified by a label that includes the product name, the name (Siderise Insulation Limited), and address of the manufacturer.
3. The report holder's contact information is the following:

SIDERISE INSULATION LIMITED
FORGE INDUSTRIAL ESTATE
MAESTEG, BRIDGEND CF34 0AH
UNITED KINGDOM
+44 1656 730833
www.siderise.com

Installation: Siderise CW-FS120 perimeter barriers and firestops for curtain walling must be installed in accordance with Siderise Insulation Limited's published installation instructions and applicable codes.



ICC
EVALUATION
SERVICE®



Intertek



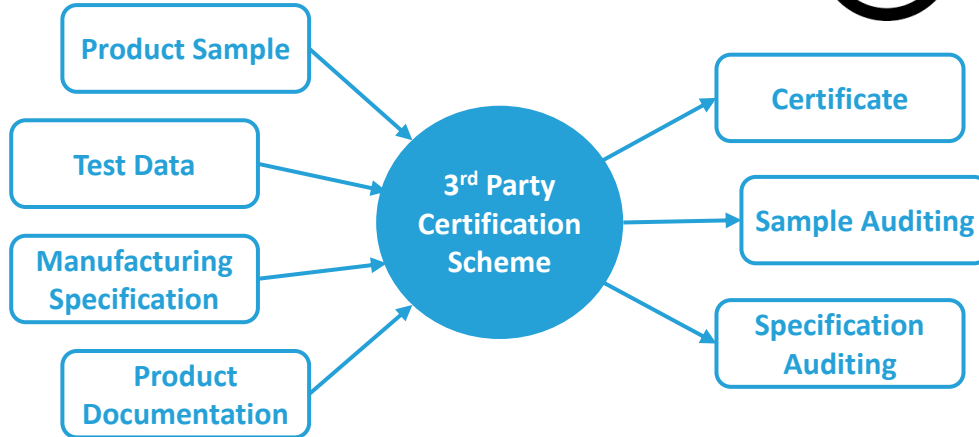
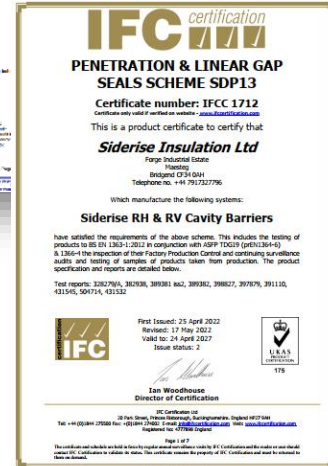


3rd Party Product Certification

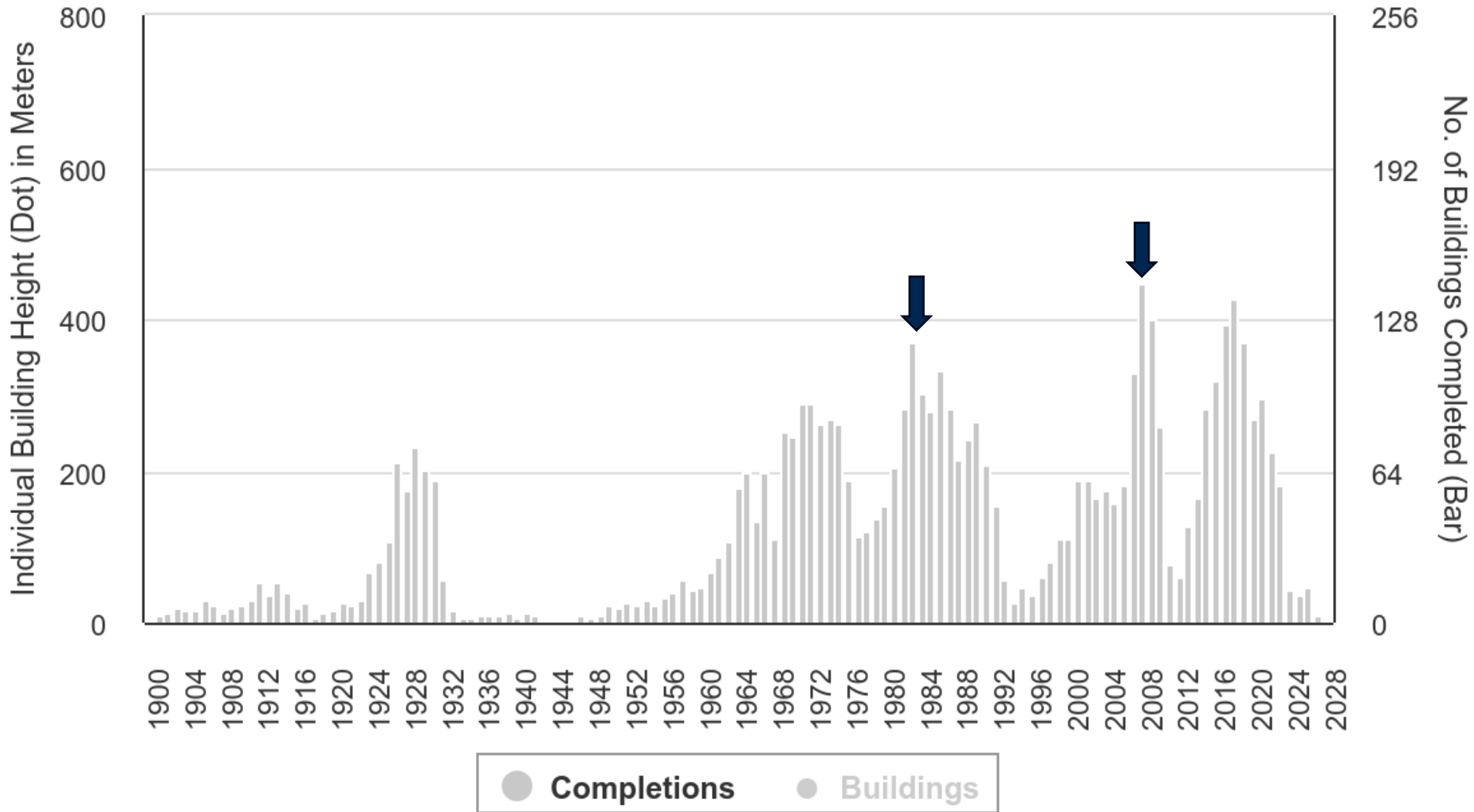
- Provides field of applications
- Gives performances of products
- Proves compliance of products
- Monitors manufacture of products
- Product assurance

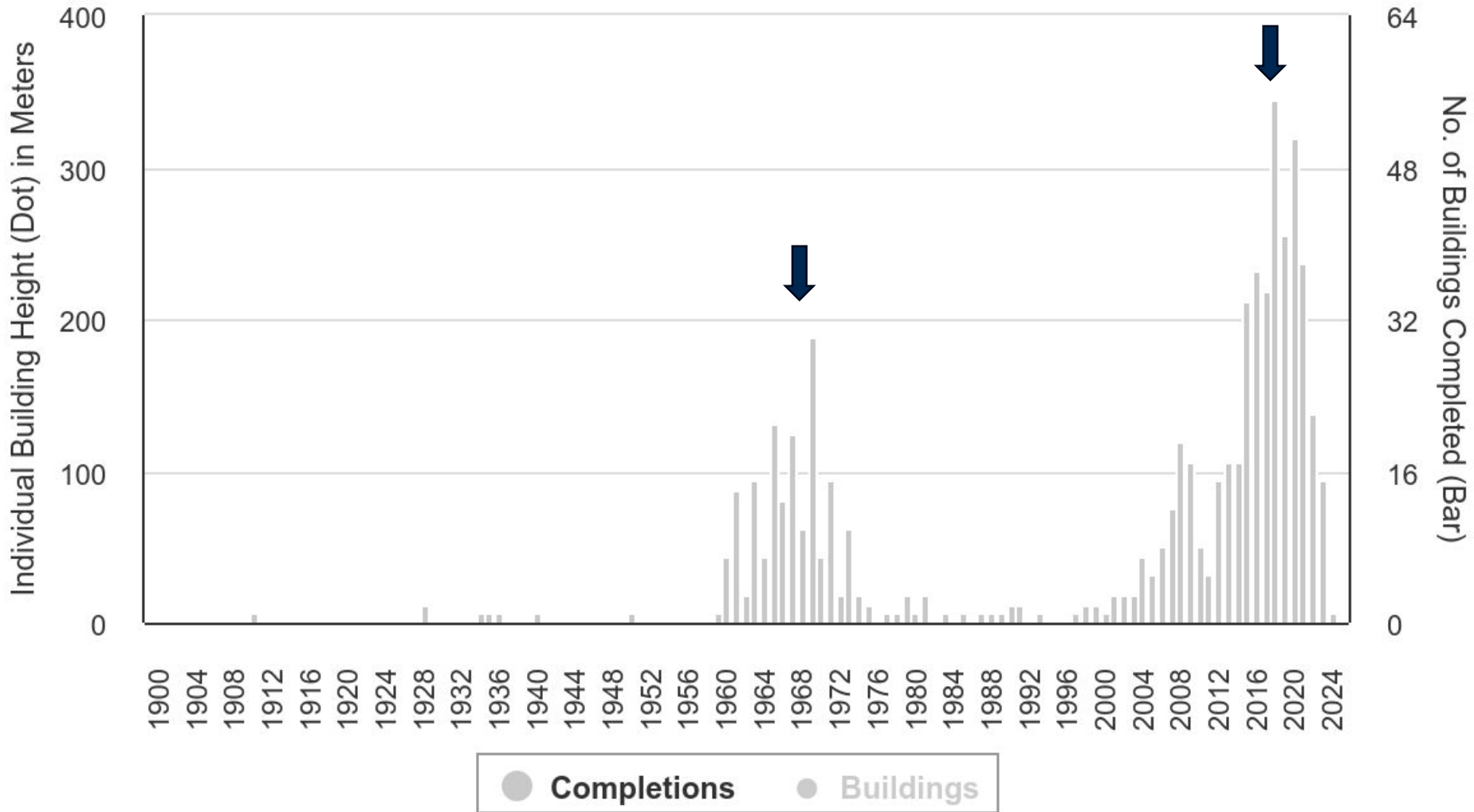


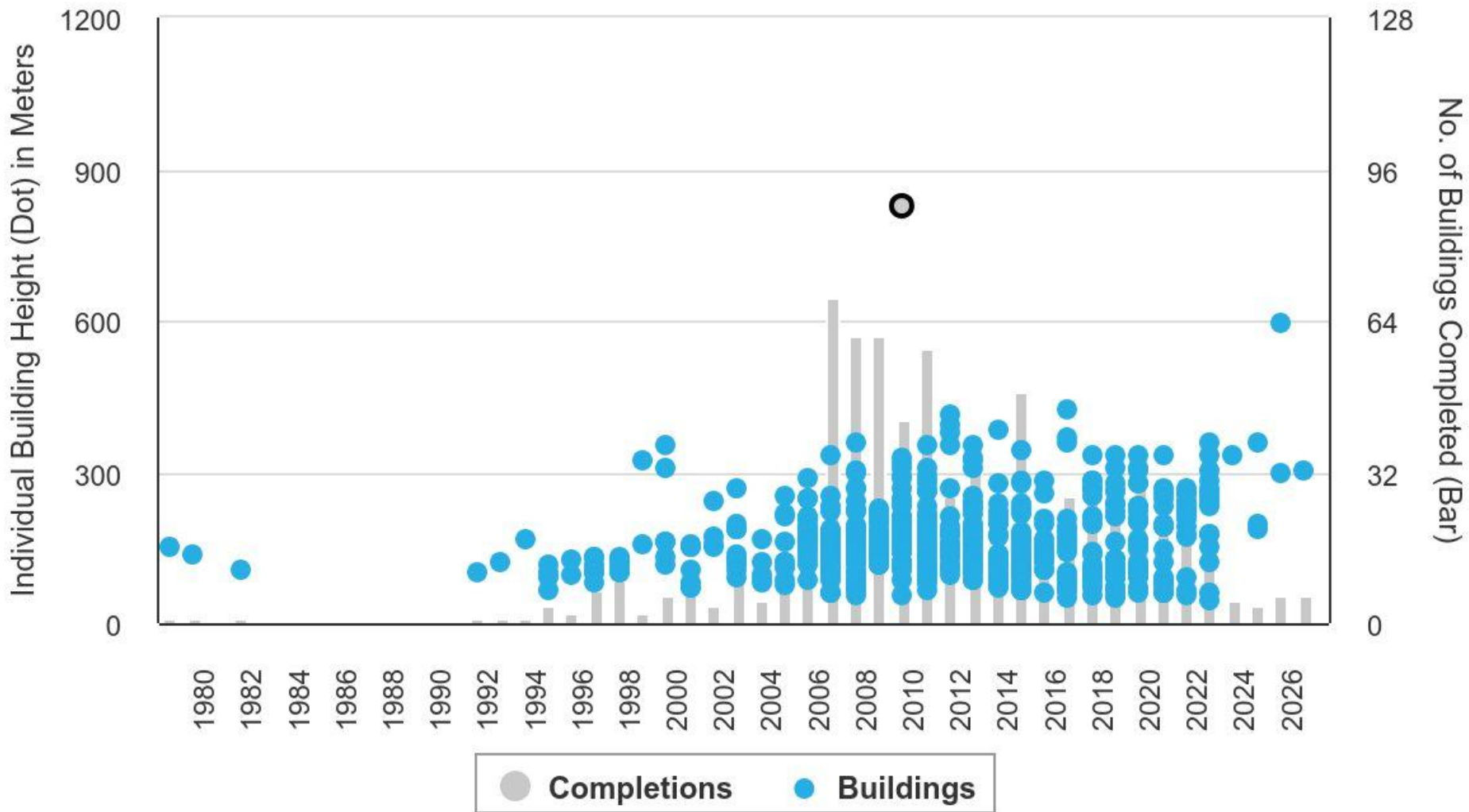
Intertek



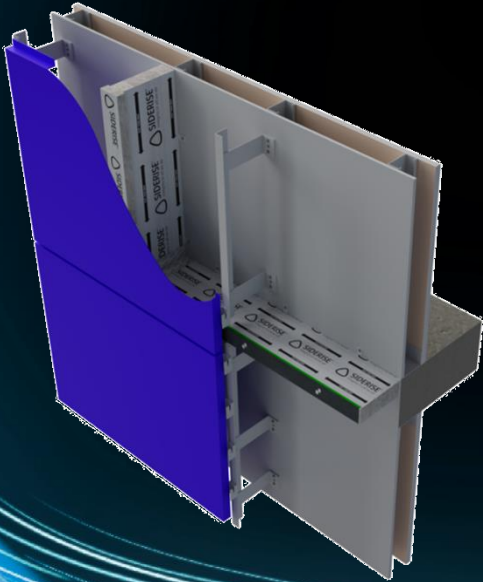
BY
YOUR
SIDE







Cladding systems & Rainscreen

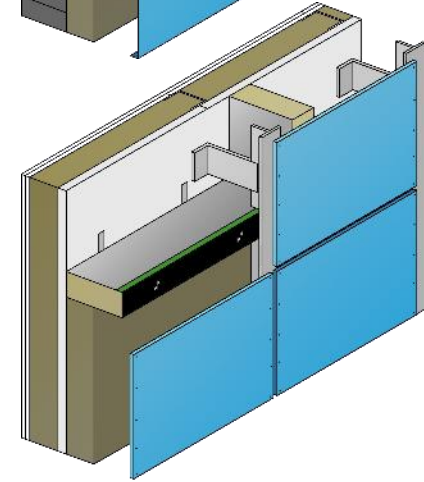
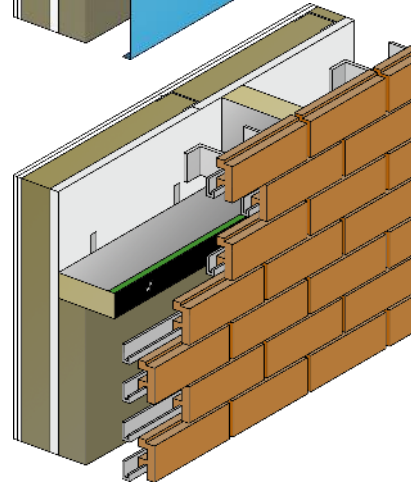
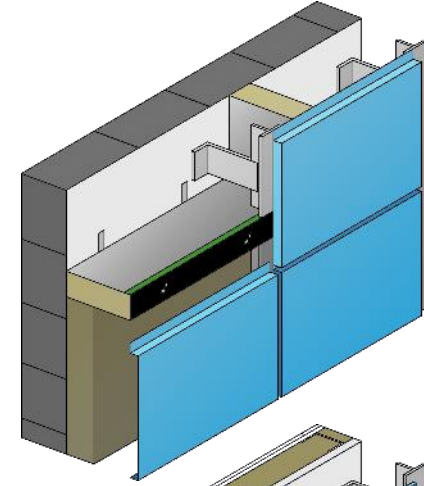
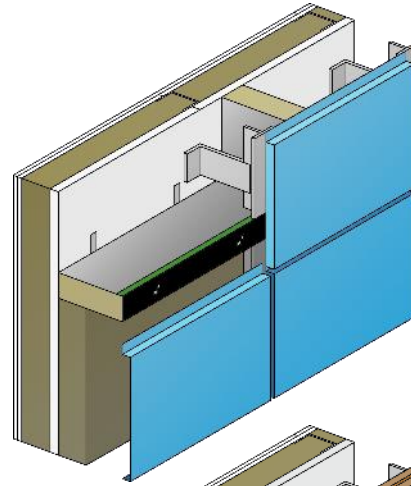




Principles of a Ventilated Facade

Differences

- Products
- Systems
- Interactions between elements
- Complex designs
- Different and changing regulations



Fundamentals of Fire

Reaction to fire

– this is classification

- Class A1 (Non- Combustible)
- Class A2 (Limited – Combustibility) and so on..

Test standard

- EN 13501 – 1 : Flames Spread, Smoke Developed and Burning Droplets
- BS 476 – Part 4 : Flame Spread
- AS 1530.1 – Methods for fire tests on building materials, components and structures - Combustibility test for materials

Large scale system Tests

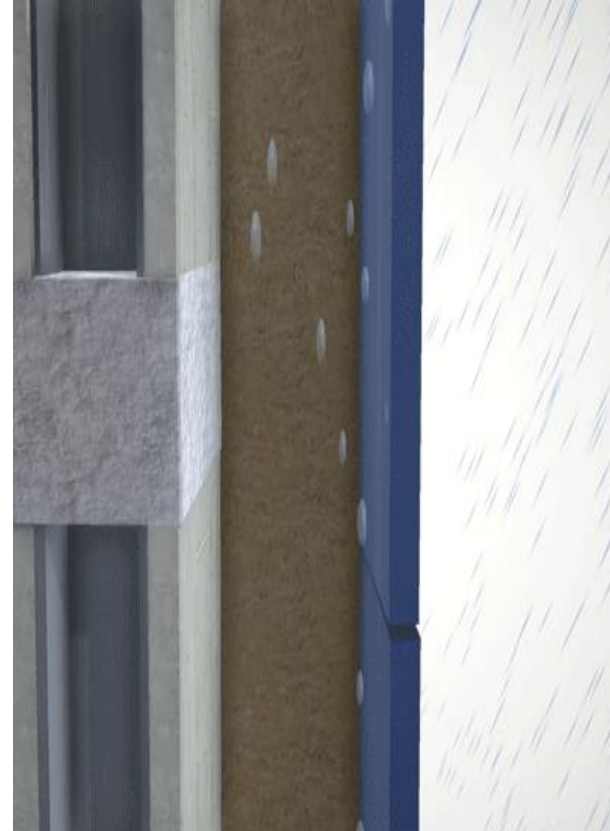
– this is performance and a system

- NFPA 285
- BS 8414 – 1
- BS 8414 – 2
- BRE 135 CLASSIFICATION
- LPS 1582
- AS 5113
- HEARD BS 9414?

Principles of a Ventilated Facade

- Key Principles

- Allows ingress / egress of air at top, base and/or joints
- Circulates air to help expel moisture
- Penetrating water /condensation is drained
- Can introduce stack effect aka chimney effect
- Introduces need for horizontal intumescent cavity barriers
- Design life



Functional Performance Requirements of Cavity Barriers

Ventilation & Drainage

Need for ventilation & drainage

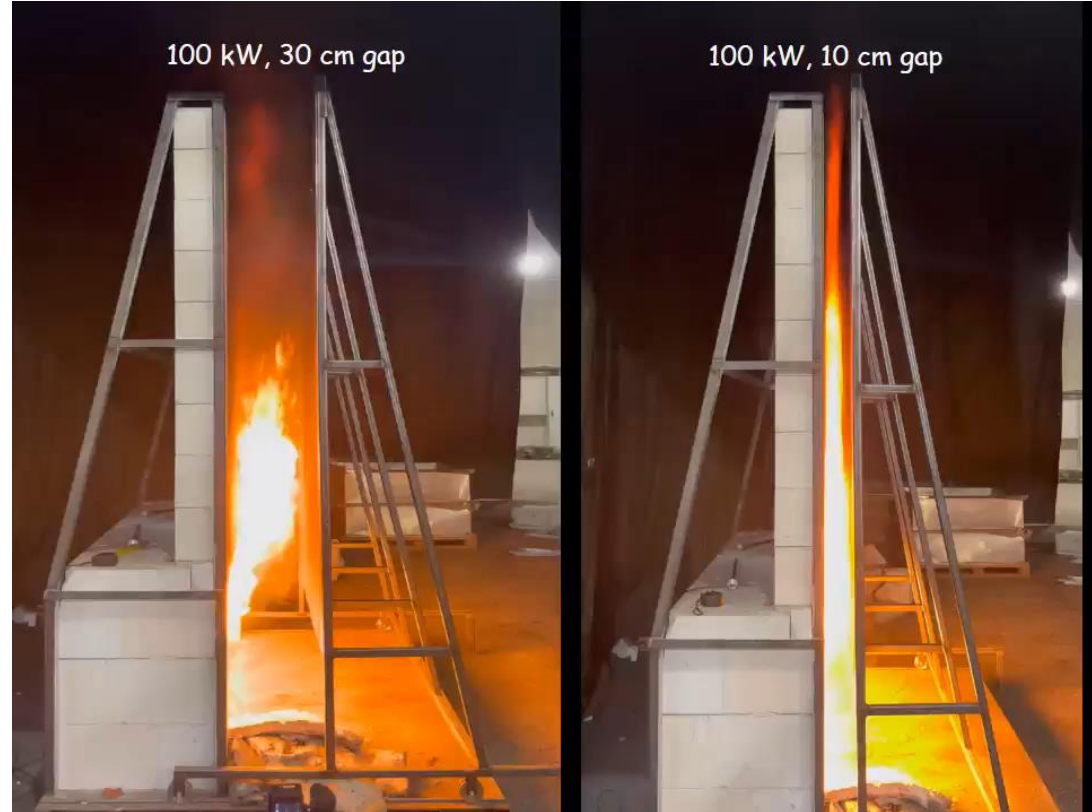
Vs

Need to prevent spread of smoke & flame

Solution:

Horizontal open state cavity barriers

- Maintains air gap under normal circumstances
- Activated at critical temperature
- 'Integrity' re-established
- Continues to expand to close air gap.



Functional Performance Requirements of Cavity Barriers

Ventilation & Drainage

Need for ventilation & drainage

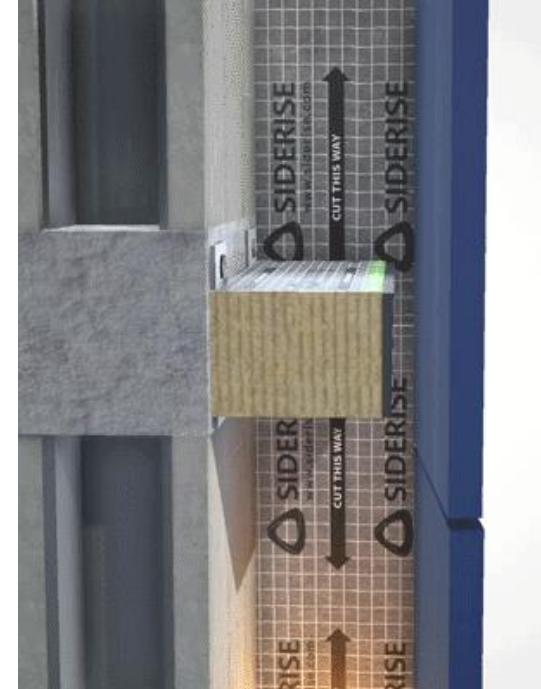
Vs

Need to prevent spread of smoke & flame

Solution:

Horizontal open state cavity barriers

- Maintains air gap under normal circumstances
- Activated at critical temperature
- 'Integrity' re-established
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Fundamentals of Fire

Table 1.14.a.: MCM and ACP On Non-Fire Resistance rated and Non-Load bearing Exterior wall coverings-Test Requirements

OCCUPANCY AND TYPE OF BUILDING	TEST 1 MCM/ ACP CORE AND PANEL AS PRODUCT	TEST 2 MCM/ ACP PANELS WITH WALL ASSEMBLY
1. SUPER HIGHRISE BUILDING	i. Core shall be tested to the criteria iii and iv.	v. BS 8414 –1 Or 2 With pass criteria as per BRE 135
2. HIGHRISE BUILDING	ii. Panel shall be tested with the thickness intended to the criteria iii and iv.	OR
3. MALLS	iii. EN 13501-1 With pass criteria A1 OR A2-s1-d0	vi. NFPA 285 With pass criteria "Pass"
4. THEME PARKS	AND	OR
5. SCHOOLS	iv. ASTM D1929 MCM/ACP shall have self ignition temperature of not less than 343°C.	vii. FM 4881 With pass criteria "Pass"
6. HOSPITALS		OR
7. ASSEMBLY		viii. ISO 13785-2 With pass criteria "Pass"



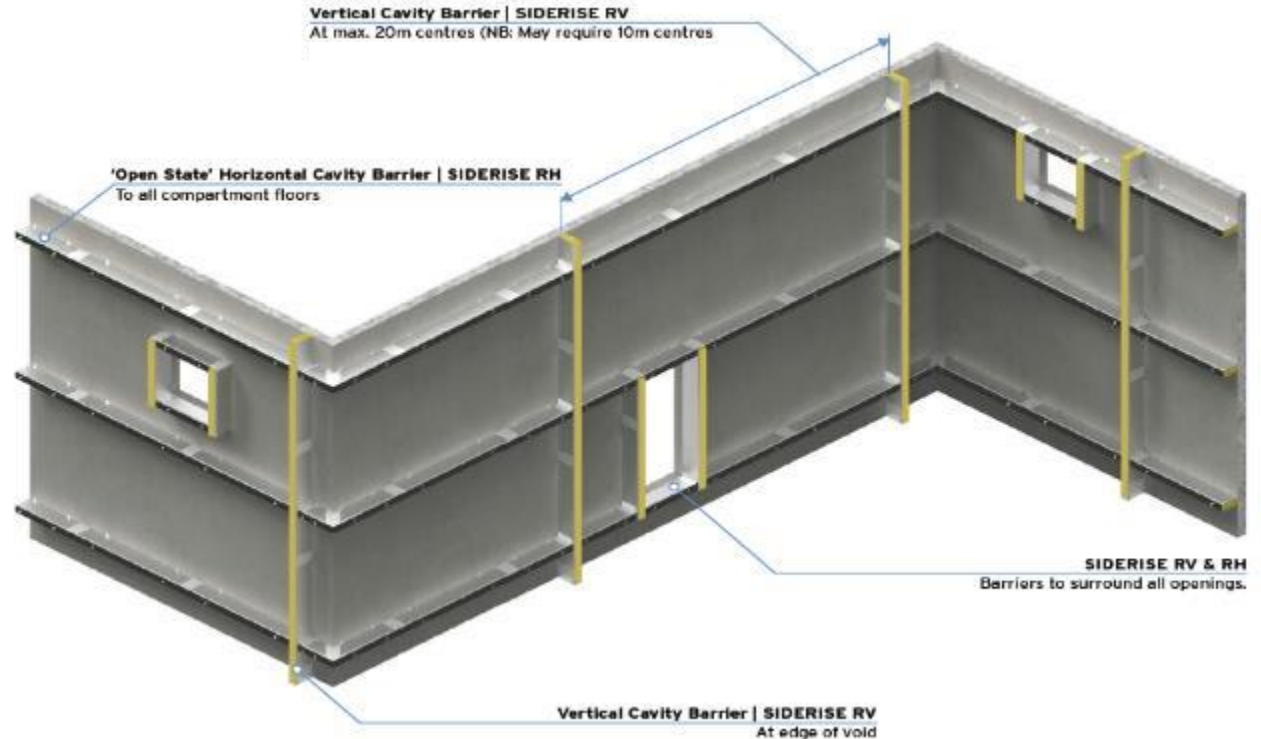
8. LOWRISE BUILDING	i. Core shall be tested to the criteria iii and iv.	v. BS 8414 –1 Or 2 With pass criteria as per BRE 135
9. MIDRISE BUILDING	ii. Panel shall be tested with the thickness intended to the criteria iii and iv.	OR
10. WAREHOUSE	iii. EN 13501-1 With pass criteria B-s1-d0	vi. NFPA 285 With pass criteria "Pass"
11. INDUSTRIAL	AND	OR
	iv. ASTM D1929 MCM/ACP shall have self ignition temperature of not less than 343°C.	vii. FM 4881 With pass criteria "Pass"
		OR
		viii. ISO 13785-2 With pass criteria "Pass"

Functional Performance Requirements of Cavity Barriers / Fire Blocking

Cavity Barrier Locations

Vertical full-fill cavity barriers also contribute to air pressure compartmentation

Vertical cavity barriers take precedent over horizontals

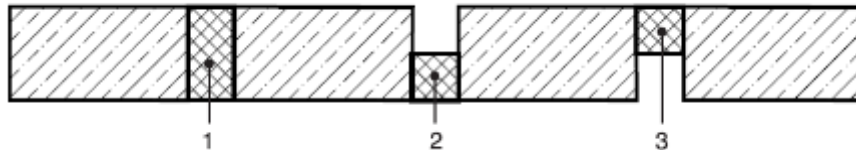


Component Testing

EN 1366-4

Fire resistance test for service installations. Linear joint seals

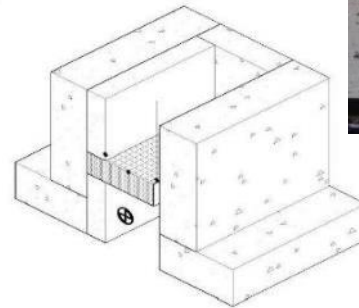
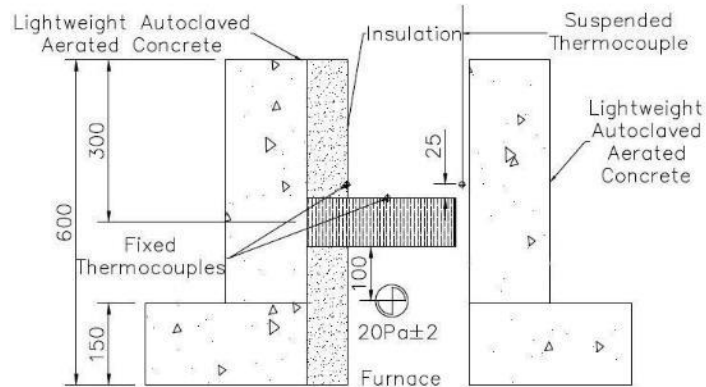
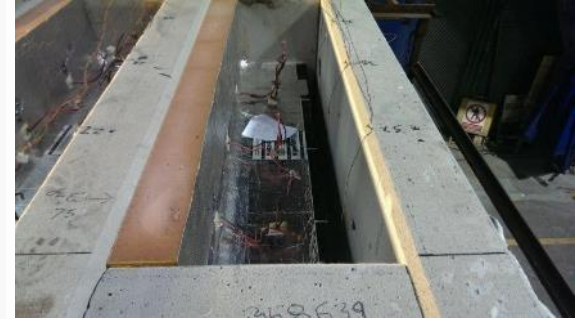
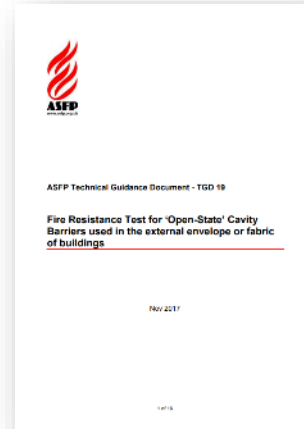
- Horizontal & vertical application testing
- Full-fill firestop/cavity barriers
- Single movement in one direction allowed before test starts (does not incorporate movement in test)



Component Testing

ASFP TGD 19 (prEN1364-6)

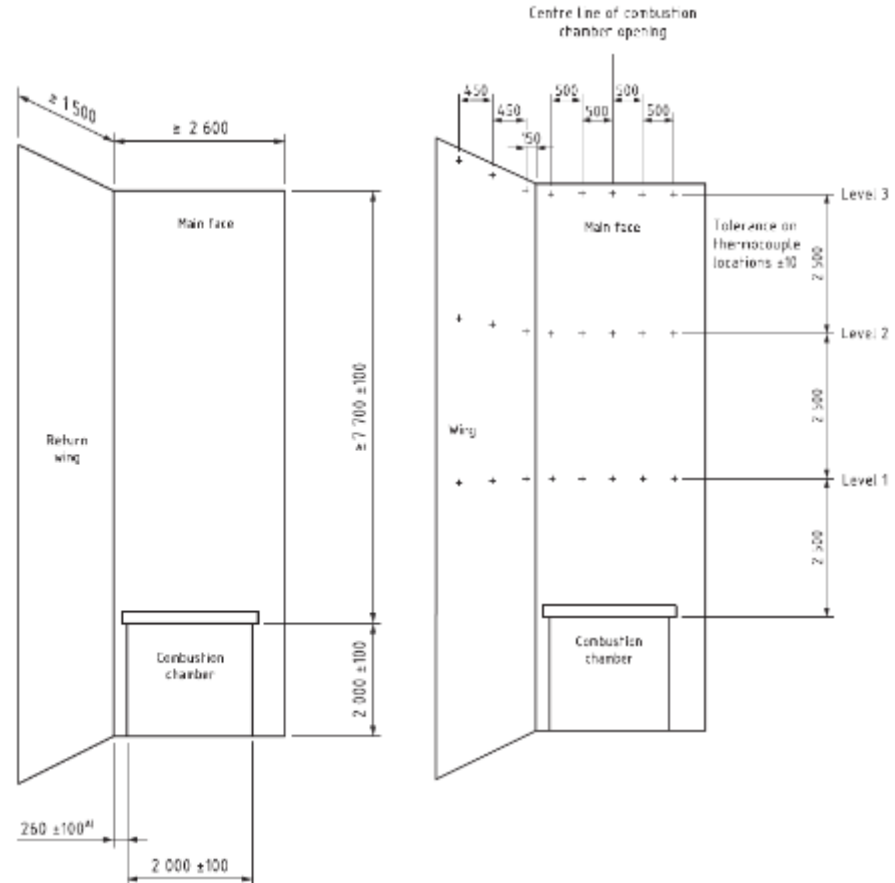
- Based on EN1366-4
- Tests with air gap
- Air gap temperature thermocouple
- Air gap closure time (11.1, 10.5: 5 mins)
- Upstands
- Thermal insulation
- Modified failure criteria



SYSTEM TESTING

BS 8414 Parts 1 & 2 2020

- Part 1 - Blockwork inner leaf
- Part 2 – Steel Frame System (SFS) inner leaf
- Thermocouple locations above cavity barriers to assess activation and heat transfer in the cavity





Dec 9, 2017 at 1:14:08 PM
Dubai



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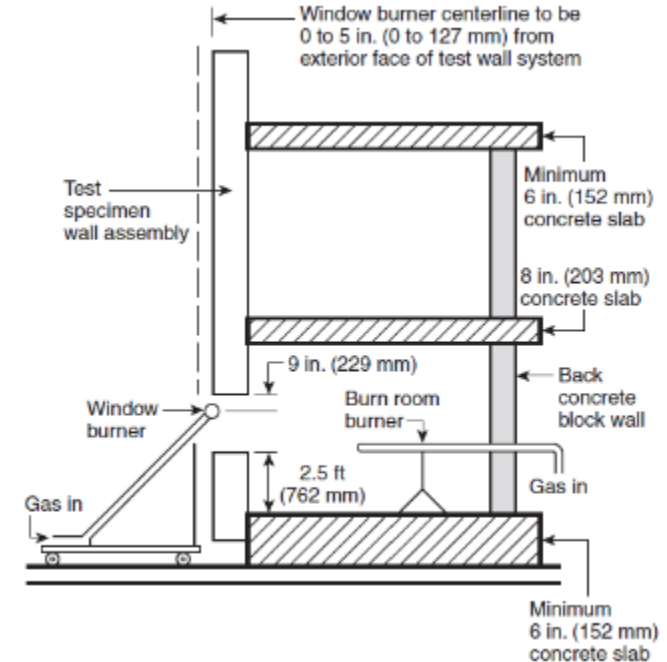
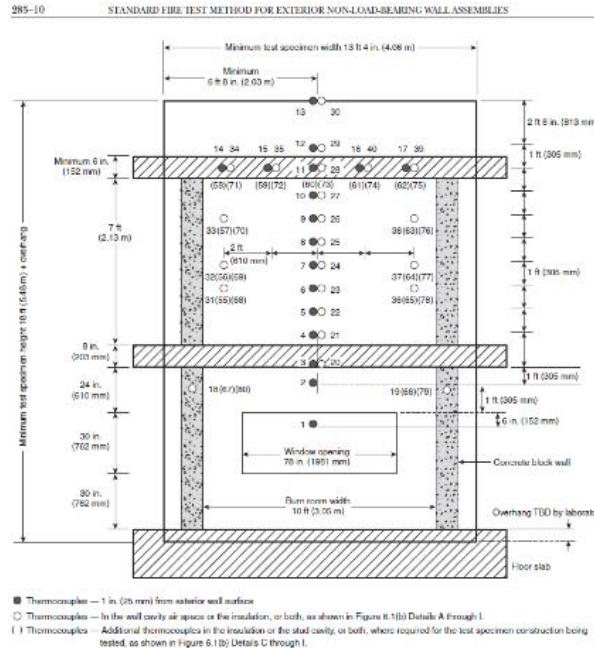
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NFPA 285: 2019

- Uses gas burners rather than crib
- No wing wall

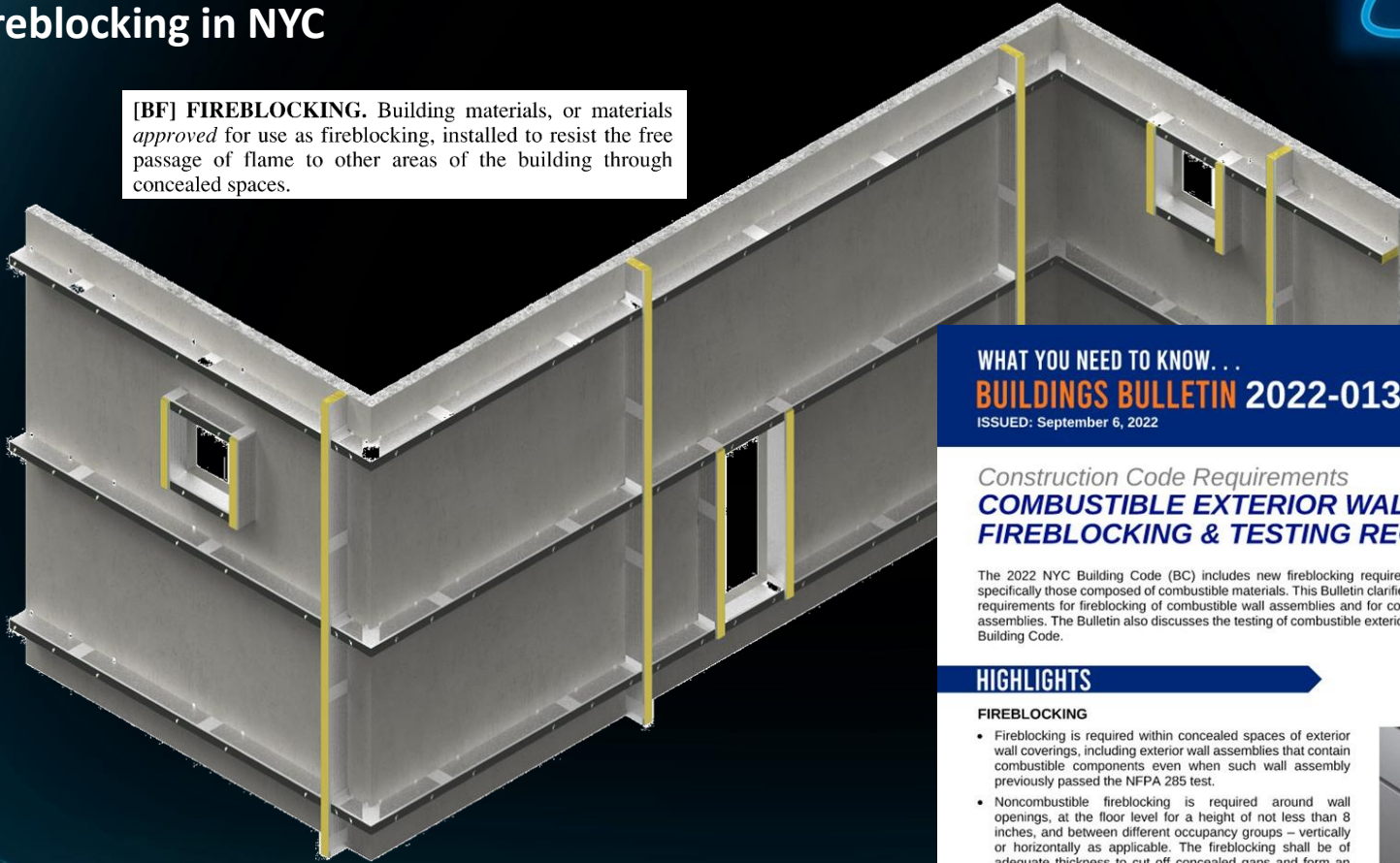


Difference In SYSTEM Performance



Fireblocking in NYC

[BF] FIREBLOCKING. Building materials, or materials *approved* for use as fireblocking, installed to resist the free passage of flame to other areas of the building through concealed spaces.



WHAT YOU NEED TO KNOW...
BUILDINGS BULLETIN 2022-013
ISSUED: September 6, 2022



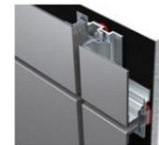
Construction Code Requirements **COMBUSTIBLE EXTERIOR WALL ASSEMBLIES: FIREBLOCKING & TESTING REQUIREMENTS**

The 2022 NYC Building Code (BC) includes new fireblocking requirements applicable to exterior wall coverings, specifically those composed of combustible materials. This Bulletin clarifies and describes the 2022 NYC Building Code requirements for fireblocking of combustible wall assemblies and for construction documents and deviations of such assemblies. The Bulletin also discusses the testing of combustible exterior wall assemblies where required by the 2022 Building Code.

HIGHLIGHTS

FIREBLOCKING

- Fireblocking is required within concealed spaces of exterior wall coverings, including exterior wall assemblies that contain combustible components even when such wall assembly previously passed the NFPA 285 test.
- Noncombustible fireblocking is required around wall openings, at the floor level for a height of not less than 8 inches, and between different occupancy groups – vertically or horizontally as applicable. The fireblocking shall be of adequate thickness to cut off concealed gaps and form an effective barrier. See *Bulletin* for limited exceptions.



SOURCE: nyc.gov



SOURCE: nyc.gov

Technical and Site Services

Siderise delivers value added advice and support throughout the construction programme via its **Technical Services and Site Services offerings**, providing additional value through contractor training and installation inspection to demonstrate compliance

	Construction programme	Siderise's involvement
Technical Services	Design Phase	Work with designers and architects to find solutions to technical challenges
	Procurement	Involved in the procurement process through joint system testing
Site Services	Construction	Provide contractors with practical installation advice and training
	Assessment & Inspection	Review completed works through proprietary mobile app

- Embedded within customer base throughout the construction programme through its Technical Services offering.
- Once the system can demonstrate compliance, it is unlikely that a customer will select a combination of products outside of that system specification
- Inspection application provides a seamless customer experience whilst providing the user with comfort that the product has been installed appropriately
- 39 employees engaged in technical functions

- Bespoke application allows contractors to submit images for review and sign-off by office based experts
- App reinforces value offering and, along with its Technical Services support, has allowed it to increase prices charged to customers

Industry Engagement

Siderise are members of a vast array of trade associations that represent various areas of the construction sector. Siderise proactively contributes and are at the forefront of legislative changes and industry trends.

Trade Association	Type
Assoc Brickwork contractors	Network
ASFP	Strategic
Chambers Wales	Operational
Construction Excellence Wales	Strategic
Council for aluminium in Building	Strategic
Construction Products Association (CPA)	Strategic
Council for Tall Buildings and Urban Habitats (CTBUH)	Strategic
Centre for Window & Cladding Technology (CWCT)	Strategic
Fire Protection Association (FPA)	Strategic
Fire Sector Federation (FSF)	Strategic
Metal Cladding and Roofing Manufacturers Association (MCRMA)	Strategic
National Federation of Roofing Contractors (NFRC)	Strategic
Structural Timber Association (STA)	Strategic
Institute of Acoustics (IOA)	Professional
Building Alliance	Strategic
Finishes & Interiors Sector (FIS)	Strategic
Institute of Fire Engineers (IFE)	Professional
International Firestop Council (IFC)	Strategic
Firestop Contractors International Association (FACIA)	Strategic
Society of Facade Engineers	Strategic
Risk Engineering Forum	Strategic
International Fire Safety Standard Coalition (IFSS)	Strategic



INTERNATIONAL FIRESTOP COUNCIL
THE Source of Firestop Expertise™



Sales & Specification Toolkit

- Our Technical Collateral package is provided to the industry via platforms such as NBS Source / Chorus, National BIM Library, and BSI Identify, including Specification Clauses to enable rapid specification by designers.

Specification Toolkit

- Technical & Safety Data
- Certification & Approvals
- Specification Clauses
- NBS Source / Chorus
- Building information Modelling (BIM)
- BSI Identify (Digital Object Identifier)
- Standard & Projects Details



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