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Curtain walls and vertical fire spread


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Fire performance of facades – glazing systems



© Standard

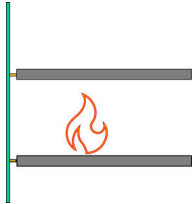
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Vertical fire spread

- ▶ Fire develops within building,
- ▶ Fire resisting floors and walls restrict fire spread,
 - ▶ compartmentation,
- ▶ Fire contained within compartment of origin.



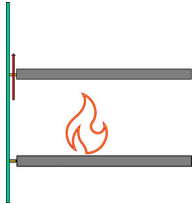
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Vertical fire spread

- ▶ With curtain wall, a firestop is required to prevent internal fire spread to floor above,
 - ▶ How is performance of fire stop assessed?
 - ▶ How does this affect construction of curtain wall?
 - ▶ Is it effective?




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Compartmentation – How do curtain walls perform?

- ▶ Limited evidence available
- ▶ LPC tests (late 1990's)
 - ▶ Stick curtain wall
 - ▶ Annealed-annealed vision glazing
 - ▶ Toughened-toughened spandrel glazing(non-fire resisting)
 - ▶ Non-insulated
 - ▶ Fire stop to back of spandrel glazing.




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Compartmentation – How do curtain walls perform?

- ▶ Glazing and spandrels failed within 15 minutes
 - ▶ Compartmentation breached
 - ▶ Fire spread to floor above.
- ▶ How do these tests relate to contemporary curtain walls?
- ▶ What is the effect of a protected spandrel?
- ▶ Government research project.



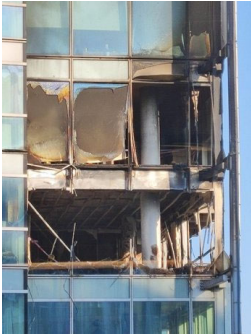
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Relay building

- ▶ Fire first observed at 15.53
- ▶ Extinguished at 19.07
- ▶ 20 fire engines/125 firefighters/64 metre ladder
- ▶ No serious injuries.
- ▶ Fire started in flat on 17th floor
- ▶ Spread externally to flat on 18th floor
- ▶ Wooden decking on balconies also involved



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CWCT Standard 6.4.3

- ▶ 'All compartment walls and floors shall be continued to the back of the building envelope. Any gaps between the compartment wall or floor and the building envelope shall be sealed with fire and smoke stopping with the same performance as the compartment floor.'
- ▶ The performance of fire stopping will depend on the properties of the fire stop, its method of fixing and the performance of the materials against which it is fixed, particularly any movement that occurs during the fire. The performance of fire stopping may be assessed in accordance with BS 476-20, BS EN 1364-4 or BS EN 1366-4.

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Performance of fire stops

- BS 476-20 Fire tests on building materials and structures —Part 20: Method for determination of the fire resistance of elements of construction (general principles),
 - Being phased out,
- BS EN 1366-4 Fire resistance tests for service installations — Part 4: Linear joint seals,
 - No longer applicable to curtain wall fire stops,
- BS EN 1364-4 Fire resistance tests for non-loadbearing elements — Part 4: Curtain walling — Part configuration,
 - Recommended procedure in ASFP advisory note 7.

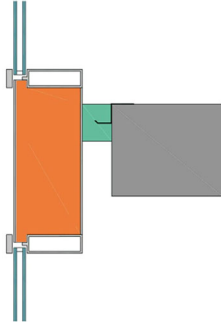
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Previous CWCT guidance (TN98)

- EN 1364-4 not applicable to 'typical' UK curtain walling which is not specifically required to have fire resisting spandrels
 - Fire stop tested to EN 1366-4 (BS 476-20) sufficient,
- Position now under review,
- Greater emphasis on functional requirements of the Building Regulations.



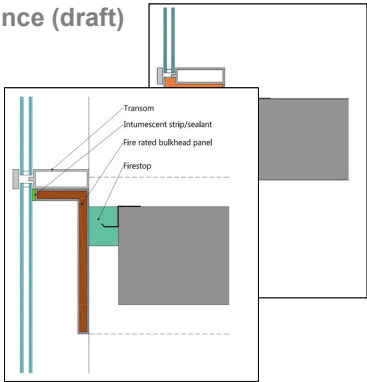
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Compartmentation – revised guidance (draft)

- Proposed hierarchy
 - EN 1364-4, use within direct field of application
 - EN 1364-4, use within extended field of application
 - EN 15254-6
 - Outside of this
 - Fire top detail based on fire engineering assessment,
 - Early engagement with fire engineer advised.



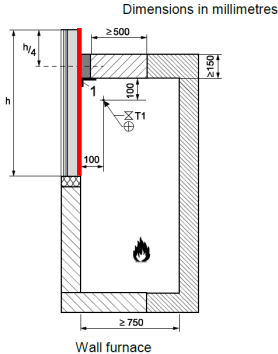
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BS EN 1364-4

- Standard configuration 5,
 - Test carried out in conjunction with protected section of curtain wall,
 - Fire stops tested to EN 1364-4 are available from main manufacturers.



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EN1364-4 Direct field of application

- ▶ Protection to back of spandrel and framing members in spandrel zone required,
 - ▶ Height of spandrel zone may be less than in test,
 - ▶ 25mm rockwool can be sufficient,
- ▶ Test of curtain wall system,
- ▶ Framing members:
 - ▶ Limited changes to dimensions and spacing permitted,
- ▶ Spandrel:
 - ▶ Limited changes to materials and size permitted,
- ▶ Rules do not apply to structural sealant glazing,
- ▶ Are rules unduly restrictive?

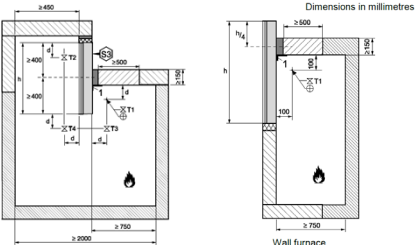
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BS EN 1364-4

- ▶ Alternative test configurations,
- ▶ Test carried out in conjunction with protected section of curtain wall,



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Building Regulation B3 (3)

- ▶ Where reasonably necessary to inhibit the spread of fire within the building, measures shall be taken, to an extent appropriate to the size and intended use of the building, comprising either or both of the following—
 - ▶ (a) sub-division of the building with fire-resisting construction;
 - ▶ (b) installation of suitable automatic fire suppression systems.

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Intention

- ▶ In the Secretary of State’s view, requirement B3 is met by achieving all of the following.
 - ▶ b. Compartmentation of buildings by fire resisting construction elements.
 - ▶ c. Automatic fire suppression is provided where it is necessary.
 - ▶ d. Protection of openings in fire-separating elements to maintain continuity of the fire separation.
- ▶ The extent to which any of these measures are necessary is dependent on the use of the building and, in some cases, its size, and on the location of the elements of construction.

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Guidance

- ▶ **7.12** At the junction with another **compartment wall** or an **external wall**, the **fire resistance** of the compartmentation should be maintained. **Fire-stopping** that meets the provisions in paragraphs 9.24 to 9.29 should be provided.
- ▶ **7.13** At the junction of a **compartment floor** and an **external wall** with no **fire resistance**, the **external wall** should be restrained at floor level. The restraint should reduce movement of the wall away from the floor if exposed to fire.

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Guidance

- ▶ **9.28** Guidance on the design, installation and maintenance of measures to contain fires or slow their spread is given in *Ensuring Best Practice for Passive Fire Protection in Buildings* produced by the Association for Specialist Fire Protection (ASFP).
 - ▶ Provides no specific guidance relating to curtain walls

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Guidance

- ▶ **9.29** Further information on generic systems, their suitability for different applications and guidance on test methods, is given in the ASFP Red Book.
 - ▶ Edge of slab Fire-stopping should only be used if tested to BS EN 1364-4 and within the field of application of the particular system, since the fire resistance periods obtained may vary from one curtain wall system to another. See 7.3.4 for more information.

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CE Marking of fire stops

- ▶ May be carried out in according with:
 - ▶ EAD 350141-00-1106 GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL of Fire Stopping and Fire Sealing Products Part 3 Linear Joint and Gap Seals
 - ▶ Formerly ETAG 026
 - ▶ CE marking in accordance with EADs is currently voluntary.
- ▶ For curtain wall fire stops;
 - ▶ EN 13830:2003 – No test Standard referenced,
 - ▶ EN 13830:2015 – Requires testing in accordance with EN 1364-4,
- ▶ Some firestops have been tested but CE marking may not be valid if the curtain wall is not the same as in the test,

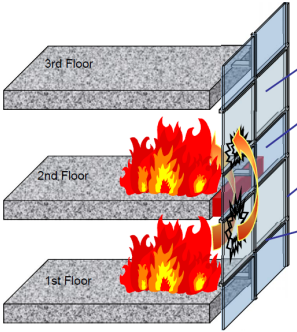
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Vertical fire spread

- ▶ Fire develops within building,
- ▶ Fire resisting floor restricts fire spread,
- ▶ With curtain wall, firestop required to prevent internal fire spread to floor above,
- ▶ Fire can break out through glazing,
- ▶ Fire plume will typically extend 2m above opening,
- ▶ Glazing on floor above may allow fire to break back in bypassing compartment floor.



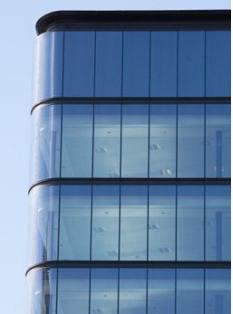
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Compartmentation – summary

- ▶ Performance of curtain wall compartmentation somewhat unknown,
- ▶ Proposing revised guidance on the subject,
- ▶ Consequences of this need to be understood,
- ▶ Seeking feedback on proposals.



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