BS EN 1364-3:2014

BSI Standards Publication

Fire resistance tests for non-loadbearing elements

Part 3: Curtain walling — Full configuration (complete assembly)

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National foreword

This British Standard is the UK implementation of EN 1364-3:2014. It supersedes BS EN 1364-3:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/22/-/7, Non loadbearing separating elements.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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Foreword

This document (EN 1364-3:2014) has been prepared by Technical Committee CEN/TC 127 “Fire safety in buildings”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2014, and conflicting national standards shall be withdrawn at the latest by July 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1364-3:2006.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of 89/106/EEC.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

CAUTION The attention of all persons concerned with managing and carrying out this fire resistance test is drawn to the fact that fire testing may be hazardous and that there is a possibility that toxic and/or harmful smoke and gases may be evolved during the test. Mechanical and operational hazards may also arise during the construction of the test elements or structures, during their testing and during the disposal of test residues.

An assessment of all potential hazards and risks to health should be made and safety precautions should be identified and provided. Written safety instructions should be issued. Appropriate training should be given to relevant personnel. Laboratory personnel should ensure that they follow written safety instructions at all times.

1 Scope

This European Standard specifies a method for determining the fire resistance of curtain walling – full configuration.

This European Standard is used in conjunction with EN 1363-1.

NOTE Annex B gives further information on the test method.

The test method is applicable to curtain walling type B (for definition see 3.4). The test is not appropriate for testing curtain walling type A (for definition see 3.3).

The fire resistance of curtain walling may be determined under internal or external exposure conditions. In the latter case the external fire exposure curve given in EN 1363-2 may be used, subject to deviating national regulations.

Tests on individual parts of a curtain walling (e.g. perimeter seal, infill panel or fixing of the framing system (anchoring) used to attach the curtain walling to the floor element) or systems with fire resistance requirements only to the spandrel area may be performed using EN 1364-4. For vertical linear gap seals, this part of the standard applies.

This European Standard does not cover double skin façades, over-cladding systems and ventilated façade systems on external walls. It does not deal with the reaction to fire behaviour of curtain walling.

This standard is intended to be read in conjunction with EN 1363-1 and EN 1363-2.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1363-1, *Fire resistance tests - Part 1: General Requirements*

EN 1363-2, *Fire resistance tests - Part 2: Alternative and additional procedures*

EN 13119, *Curtain walling - Terminology*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN 13501-2, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

EN 13830, *Curtain walling - Product standard*

EN ISO 13943, *Fire safety - Vocabulary (ISO 13943)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1363-1, EN 13119, EN 13830, EN ISO 13943 and the following apply.

3.1
anchoring
see *fixing of the framing system*

3.2
associated wall construction
form of construction required to close the vertical side of the furnace (not part of the test specimen)

3.3
curtain walling type A
curtain walling without fire resistant glazing outside the spandrel area – fire resistant only in the spandrel area

3.4
curtain walling type B
curtain walling with fire resistant glazing outside the spandrel area - fully fire resistant curtain walling

3.5
fire-resistant glazing
glazing system consisting of one or more transparent or translucent panes with a suitable method of mounting, with e.g. frames, seals and fixing materials, capable of satisfying the appropriate fire resistance criteria

3.6
fire resistant translucent or transparent infill panel
glass product, monolithic, laminated or insulating glass unit, manufactured by a particular manufacturer and intended to be used as infill panel in curtain walling, which is CE marked based on a classification according to EN 13501-2 in minimum one glazed construction

Note 1 to entry: The term “insulating” when used with “insulating glass unit” according to EN 1279–1, should not be confused with the term “insulation” used in classification standard EN 13501–2.

3.7
fixing of the framing system
system used to attach the curtain wall to the loadbearing floor. It contains the brackets but not the anchor or other devices used to fix the brackets to the floor

3.8
glazing materials
all materials used to glaze the fire resistant translucent or transparent infill panel into its frame

3.9
horizontally faceted curtain walling
curtain walling with an angle between horizontally adjacent infill panels at the common mullion (see Figure 1)

3.10
insulating glass unit (IGU)
glass product according to EN 1279–1

3.11
perimeter seal
see EN 13119

3.12
over-cladding system
protection system fixed to an external wall for weather protection

3.13
overrun time
time of fire resistance in minutes beyond the envisaged classification time, achieved in the test

3.14
simulated wall construction
wall construction, necessary as part of the test specimen in case a vertical linear gap seal between a curtain walling and an abutting wall is to be tested

Note 1 to entry: The type of wall construction will determine the field of application for the vertical linear gap seal.

3.15
span length
distance between two sequent fixing points of the framing system along the direction of a mullion

3.16
vertical linear gap seal
seal of the vertical gap between the backside of the mullion of the curtain walling and the adjacent fire resistant separating wall

4 Test equipment

See EN 1363-1, and if applicable EN 1363-2.

5 Test conditions

The heating and pressure conditions and the furnace atmosphere shall conform to those given in EN 1363-1 or, if applicable, EN 1363-2 which are related to the external fire curve.

6 Test specimen

6.1 Size

6.1.1 General

The exposed width and height shall not be less than 3 m.

There shall be a clearance of minimum 50 mm between the bottom edge of the test specimen and anything below that could give support to the test specimen (see Figures 2 and 3).

6.1.2 Internal fire exposure

The test specimen (see Figure 2) shall be of sufficient height to allow:

a) the inclusion of a spandrel area in front of the upper supporting floor as in practice. The spandrel may be cut in height so that it extends minimum 500 mm beyond the top of the upper supporting floor, if applicable.

b) the test specimen to extend 150 mm below the upper surface of the lower supporting floor with the bottom edge unsupported.

If an assessment of a vertical linear gap is required, the test specimen shall then be of sufficient width to allow a minimum of 500 mm of the test specimen to extend beyond the outside of the simulated wall.

6.1.3 External fire exposure

The test specimen shall be of sufficient height to allow the test specimen to extend minimum 150 mm below the upper surface of the lower supporting floor with the bottom edge unsupported in case the specimen is installed in front of the furnace (see Figure 3).

6.2 Number of specimens

Separate tests are necessary for internal and external exposure conditions.

Depending on the construction of the curtain walling and the intended field of application additional tests with faceted specimens may be necessary.

6.3 Design

6.3.1 General

The test specimen for internal exposure shall include the curtain walling, the perimeter seal and, if required, the vertical linear gap seal.

The test specimen for external exposure only includes the curtain walling. The supporting floors, the perimeter seal and the vertical linear gap seal may be omitted.

The test specimen or test construction, if appropriate, shall be:

a) either fully representative of the construction intended for use in practice, including fixing of the framing system, expansion joints, perimeter seals, vertical linear gap seals, any surface finishes and fittings which are essential and may influence its behaviour in the test, or

b) a standard configuration as defined in 6.3.2.

6.3.2 Standard configuration

A straight test specimen shall comprise a section of the curtain walling comprising minimum two mullions and two transoms or two vertical joints between panels in case of systems without a frame or mullions, fully exposed to the fire, see Figure 4. One of the mullions and transoms may be interrupted to allow the inclusion of T-connections. Figure 5 shows an example for the standard configuration of a test specimen including a vertical linear gap seal. Figure 6 shows an example for the standard configuration of a specimen including horizontal and vertical T-connections. Figure 7 shows details of the connection geometry between mullions and associated wall and simulated wall / vertical linear gap seal.

A faceted specimen shall comprise minimum four sections of the curtain walling forming minimum one corner of 90 degrees and two angles of 135 degrees, all sections with a minimum width of 500 mm, minimum three sections with a width of minimum 1000 mm, see Figures 8A to 8D. Two such specimens may be combined to a specimen forming two corners of 90 degrees and two angles of 135 degrees, see Figures 8E and 8F for examples. The sequence of the segments of the combined specimens may be different to that shown in Figure 8E and 8F except that the 500 mm wide section shall always be on one end.

In case a transom is located in front of the floor slab in practice the test specimen shall also contain a transom in front of the supporting floor. Such a transom is not considered being part of the perimeter seal but part of the framing.

6.3.3 Restraint

6.3.3.1 Internal exposure

The test specimen for internal exposure shall be fixed to the top and bottom supporting floor with the type of fixing of the framing system used in practice. The test specimen for external exposure shall be either fixed to a frame or fixed to the top or the bottom of the furnace as shown in Figure 9.

Both vertical edges shall be unrestrained. A suitable furnace closure at the free edge between the associated wall construction and the mullions shall be used that allows unrestrained movement of the mullions (see Figure 7 for options).

Maximum movement of the mullion is achieved when option A for detail D1 in Figure 7 is used.

6.3.3.2 External exposure

The vertical edges of the test specimen shall be unrestrained. If a construction as shown in Figure 9A is used for both vertical edges option A according to Figure 7 shall be used.

6.3.4 Surfaces

For definition of the surfaces for the installation of the thermocouples see Figure 2 for internal exposure and Figure 3 for external exposure.

NOTE Surface S2 is the external surface of the curtain walling.

6.3.5 Perimeter seal

In case mineral wool is used as backfilling material variations of the mineral wool may be used within one test specimen provided the length of the seal with a particular backfilling material is minimum the same as the distance between two mullions and it is located such that the splice between different backfilling materials is not located in the area of the mullion.

6.4 Construction

The test specimen shall be constructed as described in EN 1363-1, subject to deviating rules given in this standard.

In case a component of the curtain walling is cut all open gaps at the top end of the curtain walling shall be closed using material of class A1 according to EN 13501-1.

6.5 Verification

Verification of the test specimen shall be carried out as described in EN 1363-1.

7 Installation of the test specimen

7.1 General

For internal exposure the test construction shall include the test specimen and in addition two supporting floors and two associated walls. In case a vertical linear gap seal is included in the test specimen a simulated wall is used instead of one associated wall. The test specimen shall be fitted to the supporting floors by means of the fixing of the framing system that is used in practice, see 7.2.

For external exposure a supporting frame which supports the specimen and is designed to allow the specimen to be supported and located adjacent to the furnace in case an installation in front of the furnace is used. For standard configurations see Figure 9.

In case a test specimen according to Figures 9B or 9C is intended to be used it shall comply with the following:

a) the test specimen shall be rigidly fixed only on top (hanging curtain walling) or at bottom (standing curtain walling);

b) the fixing on the opposite side as well as the adjacent furnace closure shall allow thermal extension of the specimen as in practice;

NOTE A gap of 50 to 100 mm is considered sufficient to allow thermal extension as in practice.

7.2 Supporting floors

7.2.1 Standard supporting floor

The standard supporting floor shall have a minimum thickness of 150 mm and minimum width of 500 mm for straight specimens. For faceted specimens the minimum width shall be 200 mm (see Figure 13). The floor shall be made of reinforced concrete or made of reinforced aerated concrete and shall be restrained at three sides.

7.2.2 Non-standard supporting floor

Any floor construction as in practise may be used. The results of the test are limited to that floor construction only (no field of direct application concerning floor constructions).

7.3 Simulated wall construction

7.3.1 Standard construction

The construction details of standard wall constructions shall be in accordance with EN 1363-1. The method of sealing the vertical linear gap between the test specimen and the simulated wall construction shall be recorded in the test report.

7.3.2 Non-standard construction

Any wall construction as in practise may be used. The result of the test is limited to that construction only (no field of direct application).

7.4 Furnace closure

The furnace closure shall be done with a mineral wool packing of class A1 according to EN 13501-1 to allow the specimen to move to a similar extent as in practice.

8 Conditioning

The test construction shall be conditioned in accordance with EN 1363-1.

9 Application of instrumentation

9.1 Thermocouples

9.1.1 Furnace thermocouples (plate thermometers)

Plate thermometers shall be provided in accordance with EN 1363-1. There shall be at least one for every 1,5 m^2 of the exposed surface area of the test construction. The plate thermometers shall be oriented so that side 'A' faces the back wall of the furnace. In case of faceted specimens the plate thermometers shall be located in a way that allows a good control of the temperature distribution inside the furnace. If the specimen shades the plate thermometer the maximum distance from the plate thermometer to the specimen may be increased to (250 ± 50) mm. For details of location of plate thermometers in case of faceted specimens see Figure 10.

9.1.2 Unexposed face thermocouples

9.1.2.1 General

The general rules for the attachment and exclusion of unexposed face thermocouples given in EN 1363-1 shall apply.

9.1.2.2 Mean temperature rise

The mean temperature rise shall be measured on each discrete infill / panel area ≥ 0,1 m^2 by means of one thermocouple per 1,5 m^2, subject to minimum two thermocouples per discrete area. The mean temperature rise shall only be measured in the upper spandrel area and the non-spandrel area (e.g. vision glass area). The thermocouples shall be located in two opposite corners at a distance of approximately a third of the width and approximately a third of the length of the discrete area, see Figure 11. If due to the size of the discrete area a third thermocouple is required it shall be positioned close to the centre of the discrete area. In case more thermocouples are required, one shall be located close to the centre of the infill / panel and the others close to the centre of each quarter section. Records from all discrete areas of the same type shall be used for calculating the mean temperature rise. Thermocouples shall not be positioned closer than 100 mm from any discrete area that is not being evaluated for insulation.

For test specimens which are non-uniform, i.e. those which have surface corrugations or ribs, the temperature of each area/surface type shall be monitored to determine the mean temperature rise.

As there are no evaluation criteria for the perimeter seal, the mean temperature rise is not measured.

9.1.2.3 Maximum temperature rise

9.1.2.3.1 General

Thermocouples for the determination of maximum temperature rise may need to be added or their location be changed for particular constructions other than the ones shown in Figures 4 to 6 (straight specimen) and 12 to 14 (faceted specimen). Clauses 9.1.2.3.2 to 9.1.2.3.6 for the location of thermocouples for determination of maximum temperature rise are obligatory for standard configurations and are given as guidance for non-standard configurations.

The mean temperature rise thermocouples shall also be used to evaluate the maximum temperature rise.

9.1.2.3.2 Surface 1

For the determination of maximum temperature rise, additional thermocouples shall be applied to Surface 1 as follows and given in Figure 15 for straight specimens and Figure 12 for faceted specimens:

— Thermocouple 1A - 20 mm below the upper edge of the visible spandrel panel area at mid width of the panel;

— Thermocouple 1B - on a mullion 20 mm below the upper edge of the visible spandrel panel area;

— Thermocouple 1C - at the junction of a mullion and a transom;

— Thermocouple 1D – at mid height of the edge panel with the maximum height and/or largest area, 150 mm in from the outer panel edge in case of installation according to Figure 9B and 9C or minimum 150 mm in from the inner surface of the furnace wall in case of installation according to Figure 9A;

— Thermocouple 1F - at mid way between two mullions, where possible, at a transom or a horizontal joint between infill panel / infill panel or infill panel / spandrel panel (in the positive pressure zone);

— Thermocouple 1G - at mid way between two transoms, where possible, on a mullion or a vertical joint between infill panel / infill panel (in the positive pressure zone) for each type of infill panel;

— Thermocouple 1H - at mid-height of the panel with the largest area, 20 mm from the mullion for each type of infill panel and spandrel panel. If the largest panel is not the tallest panel, then another thermocouple shall be placed at mid-height of the tallest panel, 20 mm from the mullion or the joint between panel / panel;

— Thermocouple 1I – at mid-width of the panel with the largest area, 20 mm from the transom at the top edge of the panel for each type of infill panel and spandrel panel. If the largest panel is not the widest panel, then another thermocouple shall be placed at mid-width of the widest panel, 20 mm from the transom or the joint between panel / panel at the top edge of the panel. Thermocouples 1I are used when the upper transom of the panel is located in the heated area. If this is not the case, thermocouples 2K are used;

— Thermocouple 1J – in the top corners of the panel with the largest area and additionally in the top corners of the highest placed panel, if this is not the same panel, for each type of infill panel and spandrel panel, 20 mm from the mullion and the transom. Thermocouples 1J are used when the upper transom of the panel is located in the heated area. If this is not the case, thermocouples 2K are used;

— Thermocouple 1K – in the bottom corners of the highest placed non-glazed panel, if there is no upper transom in the heated area, for each type of panel, 20 mm from the mullion and the transom.

9.1.2.3.3 Surfaces 2 and 6

For the determination of maximum temperature rise, additional thermocouples shall be applied as follows and as given in Figures 4 to 6 for straight specimens and Figure 13 for faceted specimens:

— Thermocouple 2A - 20 mm below the soffit of the upper supporting floor at mid width of a spandrel panel (Surface 2);

— Thermocouple 2B - 20 mm below the soffit of the upper supporting floor in line with a mullion (Surface 2);

— Thermocouple 2C - at the junction of a mullion and a transom (Surface 2);

— Thermocouple 2F - at mid way between two mullions, where possible, at a transom or a horizontal joint between infill panel / infill panel or infill panel / spandrel panel (in the positive pressure zone) (Surface 2);

— Thermocouple 2G - at mid way between two transoms, where possible, at a mullion or a vertical joint between infill panel / infill panel (in the positive pressure zone) for each type of infill panel (Surface 2);

— Thermocouple 2H - at mid-height of the panel with the largest area, 20 mm from the mullion for each type of infill panel and spandrel panel. If the largest panel is not the tallest panel, then another thermocouple shall be placed at mid-height of the tallest panel, 20 mm from the mullion or the joint between panel / panel (Surface 2);

— Thermocouple 2I – at mid-width of the panel with the largest area, 20 mm from the transom at the top edge of the panel for each type of infill panel and spandrel panel. If the largest panel is not the widest panel, then another thermocouple shall be placed at mid-width of the widest panel, 20 mm from the transom or the joint between panel / panel at the top edge of the panel (Surface 2). Thermocouples 2I are used when the upper transom of the panel is located in the heated area. If this is not the case, thermocouples 2K are used;

— Thermocouple 2J – in the top corners of the panel with the largest area and additionally in the highest placed panel, if this is not the same panel, for each type of infill panel and spandrel panel, 20 mm from the mullion and the transom (Surface 2). Thermocouples 2J are used when the upper transom of the panel is located in the heated area. If this is not the case, thermocouples 2K are used;

— Thermocouple 2K – in the bottom corners of the highest placed non-glazed panel, if there is no upper transom in the heated area, for each type of panel, 20 mm from the mullion and the transom;

— Thermocouple 6A - at the junction of the soffit of the upper supporting floor with the non-heated face of the simulated wall construction (Surface 6);

— Thermocouple 6B - 500 mm below thermocouple 6A (Surface 6).

— Thermocouple 6C - 20 mm below the soffit of the upper supporting floor at mid width of the vertical linear gap seal;

— Thermocouple 6D – at mid height and mid width of the vertical linear gap seal.

NOTE Thermocouples on Surface 6 are only required if a vertical linear gap seal is fitted.

9.1.2.3.4 Surfaces 3 and 4

For the determination of maximum temperature rise, additional thermocouples shall be applied as follows and as given in Figures 16 and 17 for straight specimens and Figure 14 for faceted specimens:

— Thermocouple 3A - 20 mm up from top of the upper supporting floor at mid width of the spandrel panel (Surface 3);

— Thermocouple 3B - 20 mm up from top of the upper supporting floor on a mullion surface, parallel to the furnace opening (Surface 3);

— Thermocouple 3C - 20 mm up from top of upper supporting floor on a mullion surface, 90° to the furnace opening (Surface 3);

— Thermocouple 4A - at the junction of the soffit of the upper supporting floor with the non-heated face of the simulated wall construction (Surface 4);

NOTE 1 Thermocouple 4A is opposite thermocouple 6A which is on Surface 6.

— Thermocouple 4B - 500 mm below thermocouple 4A (Surface 4).

NOTE 2 Thermocouple 4B is opposite thermocouple 6B which is on Surface 6.

— Thermocouples on Surface 4 are only required if a vertical linear gap seal is part of the test specimen.

9.1.2.3.5 Perimeter Seal

For the determination of the maximum temperature rise, thermocouples shall be applied to the perimeter seal as follows (see Figures 4 to 6):

— Thermocouple HV - at the top surface of the seal, centrally between the mullions and centrally across the perimeter seal;

— Thermocouple HW - at the top surface of the seal 20 mm from a mullion centrally across the perimeter seal;

— Thermocouple HV1 - at the top surface of the seal located at quarter point between the mullions at the position where the seal abuts the floor;

— Thermocouple HV2 - at the top surface of the seal located at quarter point between the mullions at the position where the seal abuts the panel;

— Thermocouple HZ - if there is a splice in the gap seal this thermocouple shall be positioned adjacent to the perimeter seal at a position 20 mm from the splice;

— Thermocouple HT – in case a transom is located in front of the supporting floor or so close to the supporting floor, that it is in contact with the perimeter seal, on top of the transom at mid length and mid width (see Figure 18).

9.1.2.3.6 Vertical linear gap seals

If required, the determination of the maximum temperature rise shall be done using thermocouples on the linear gap seal as follows (see Figure 19):

— Thermocouple VX - at the top of the vertical linear gap seal, 20 mm below the soffit of the upper supporting floor, located centrally across the vertical linear gap seal;

— Thermocouple VY - 500 mm below thermocouple VX;

— Thermocouple VZ – on the mullion abutting the vertical linear gap seal, one at the height of thermocouple VX and one at the height of thermocouple VY located centrally across the mullion depth.

9.1.2.4 Roving thermocouple

A roving thermocouple in accordance with EN 1363-1 shall be provided for measuring maximum temperature at any point.

9.1.2.5 Additional thermocouples

Any further thermocouples used to provide additional information (e.g. for measuring temperatures inside the wall) shall be attached without damaging the specimen.

9.1.2.6 Thermocouples on the fixing of the framing system

Thermocouples shall be provided to measure the temperature of any fixing used to attach the curtain walling to the supporting floor.

9.2 Pressure

Furnace pressure shall be measured as detailed in EN 1363-1.

9.3 Deflection

Where deflection is intended to be determined appropriate instrumentation shall be provided to determine a history of all significant deflection (i.e. greater than 5 mm) of the test specimen during the test. The interval of measurement shall not exceed 5 min.

Deflection shall be measured at mid height of the unexposed surface (S1 or S2 respectively) of the test specimen at each mullion exposed to the fire and at mid width of the transom closest to the centre of the exposed area of the test specimen, at the centre of this exposed surface. In case a cover plate is part of the construction this should be partially removed in the area of the deflection measurement to allow deflection measurement on the mullion / pressure plate directly. Open gaps at the cut end of the cover plate shall be closed using material of class A1 according to EN 13501-1.

Guidance on the application of deflection measurement is given in EN 1363-1.

NOTE There is no performance criteria associated with deflection but maximum deflection values are provisions of some field of application rules.

9.4 Radiation

If radiation is to be measured, it shall be done according to EN 1363-2. Radiometers shall be positioned opposite the geometric centre of that part of the unexposed area of the test specimen that is heated.

10 Test procedure

The test shall be carried out using the equipment and procedures in accordance with EN 1363-1 and, if applicable, EN 1363-2.

11 Performance criteria

The criteria by which the performance of the test specimen is judged are given in EN 1363-1. The results for the insulation and integrity shall be presented separately for external exposure, internal exposure, the perimeter seal and the vertical linear gap seal, as shown in Table 1.

The temperature of the fixing of the framing system shall be measured and recorded. Failure of the fixing, indicated by sagging of the specimen, shall also be observed and recorded.

Measurement of the temperature of the fixing of the framing system is not a classification criterion but may be used in evaluating the possible reduction in structural strength of the fixing.

Other observations as specified in EN 1363-1 shall be made and recorded. Falling parts from the curtain walling construction may be recorded if required according to national regulations.

NOTE There is no performance criteria associated with falling parts.

Table 1 — Performance criteria

Fire exposure	Component / Surface		Integrity			Insulation		Radiation
			Cotton pad	Gap gauge	Flaming	Mean temperature rise	Maximum temperature rise	
Internal	Curtain walling	S2	Y	Y	Y	Y	$_{Y}$ b	Y
Internal		S3	Y	–	Y	Y	$_{Y}$ b	-
Internal		S4	Y	–	Y	$_{Y}$ a	$_{Y}$ a	-
Internal		S5	Y	-	Y	-	-	-
Internal		S6	Y	–	Y	–	$_{Y}$ a	-
External		S1	Y	Y	Y	Y	$_{Y}$ b	Y
Internal	Perimeter seal		Y	Y	Y	–	Y	-
Internal	Vertical linear gap seal, if required		Y	Y	Y	–	Y	-

a Only where a vertical linear gap seal is part of the test specimen

b For each infill / panel type

12 Test report

In addition to the items required by EN 1363-1, the following shall also be included in the test report:

a) reference that the test was carried out in accordance with EN 1364-3;

b) the type of specimen, i.e. straight or faceted;

c) the results identified in accordance with the performance criteria in Table 1;

d) temperature curve used;

e) if required, the time when parts fell off from Surfaces S2, S5 and S6 and their approximate size.

13 Field of direct application of test results

13.1 General rules

13.1.1 General

The rules given in 13.2 to 13.4 apply to stick constructions only. For rules for unitised constructions see Annex A.

The rules given in 13.2 to 13.4 shall not be used for curtain walling constructions with glued infill panels (e.g. Structural Sealant Glazing Systems – SSGS).

Rules which result in higher weight of the curtain walling are only applicable if the fixing of the framing system used in practice has been designed for the higher load. The measured temperature at the fixing of the framing system shall be taken into account.

13.1.2 Exposure conditions

Test results from tests using the standard temperature time curve cover a test condition using the external fire curve but not vice versa.

13.1.3 Overrun time

For some rules to be applicable an overrun time in the fire test result compared to the envisaged classification time is required. The required overrun time is shown in Table 2. The overrun time is required for the following criteria:

— E classification: integrity

— EW classification: integrity and radiation

— EI classification: integrity and insulation

Table 2 — Overrun time

Classification Time	Overrun time
≤ 20 min	minimum 3 min
30, 45 and 60 min	minimum 6 min
≥ 90 min	minimum 10 % of the classification time

13.2 Rules for the complete construction

13.2.1 Width of the curtain walling

Test results are equally valid for curtain walling with classification E and EI extending over one or more fire separating walls with a higher distance between the fire separating walls than the width of the tested construction provided

— the construction (distance of mullions etc.) are the same as the one tested;

— option A for detail D1 according to Figure 7 was used in the test on one side, and

— a vertical linear gap seal abutting a simulated wall according to Detail D3 in Figures 18 and 19 was used on the other side.

Test results are equally valid for curtain walling with a higher width than the width of the tested construction in case they are not abutting fire separating walls provided

— the construction details (distance of mullions etc.) are the same as the one tested and

— option A for detail D1 according to Figure 7 was used in the test on one side and Detail D2 or option B for detail D1 on the other side.

NOTE Width refers to the heated area of the test specimen.

13.2.2 Height of the curtain walling

Test results are valid for a curtain walling of increased overall height, i.e. repetition of the tested construction in vertical direction provided the construction is the same as the one tested.

NOTE Height refers to the heated area of the test specimen.

13.2.3 Span length

Test results are also valid for curtain walling with classification E and EI for a higher span length subject to a maximum of 1,2 times the span length used in the test provided

— the maximum deflection perpendicular to the surface measured during the fire test is less than 100 mm, and

— there is sufficient elongation allowance of the mullions.

Test results are also valid for a higher span length subject to a maximum of 1,3 times the span length used in the test provided

— an overrun time as defined in Table 2 has been achieved, and

— the maximum deflection perpendicular to the surface measured during the fire test is less than 100 mm, and

— there is sufficient elongation allowance of the mullions.

Test results are also valid for a higher span length subject to a maximum of 1,5 times the span length used in the test provided

— an overrun time as defined in Table 2 has been achieved, and

— the maximum deflection perpendicular to the surface measured during the fire test is less than 50 mm, and

— there is sufficient elongation allowance of the mullions.

13.2.4 Installation angle (vertical/sloped)

Test results on a vertical curtain walling cover curtain walling sloped inside or sloped outside to a maximum angle of 10° from the vertical axis for both exposure orientations (o → i and i → o).

Test results on a vertical curtain walling with an E or EW classification cover curtain walling sloped inside or sloped outside to a maximum angle of 12,5° from the vertical axis provided an overrun time was achieved according to Table 2 and the screws for fixing the infill panels / spandrel panels penetrate the mullions/transoms.

Test results on a vertical curtain walling with an EI classification cover curtain walling sloped inside or sloped outside to a maximum angle of 15° from the vertical axis provided an overrun time was achieved according to Table 2 and the screws for fixing the infill panels / spandrel panels penetrate the mullions/transoms.

13.2.5 Facet angles of horizontally faceted curtain walling

13.2.5.1 Installation tolerance

Facet angles between 0 and 1,5° (angle β in Figure 1) is covered by a test on a straight curtain walling. In case the curtain walling includes fire resistant translucent or transparent infill panels the rule is only applicable if the overlap of the pressure plate and/or the edge cover on the inner side of a fire resistant translucent or transparent infill panel, whatever is smaller, is minimum the same as in the fire test for infill panels with EI classification and the same as tested for infill panels with E or EW classification (see Figure 20).

13.2.5.2 Small facet angles

Facet angles between ≥ 1,5 ° and 5 ° are covered by a test on a straight curtain walling provided

— the system remains the same as in the fire test and

— the pressure plate remains the same as in the fire test and

— the nominal inner or outer edge cover of the translucent or transparent infill panel, whichever would be decreased by the inclination of the translucent or transparent infill panel, remains the same as in the fire test and

— an overrun time according to Table 2 has been achieved.

NOTE The maximum facet angle covered will depend on the thickness of the translucent or transparent infill panel and on the maximum distance the translucent or transparent infill panel can be moved towards the centre of the mullion.

This rule does not apply to curtain walling with E and EW classification.

13.3 Framing system

13.3.1 Distance between mullions and transoms

The distance between the mullions and transoms is defined by the rules for the infill panels, based on test results on straight specimens.

Test results on a higher distance between the mullions and/or transoms cover smaller distances.

Test results cover a higher distance between mullions and/or transoms than tested subject to the rules given in 13.4, provided that all of the relevant frame junctions have been tested in accordance with this standard.

13.3.2 Geometry/dimension of mullions and transoms

Test results cover higher wall thickness of mullions and transoms made of metal subject to a maximum of 1,5 times the thickness used in the test. Decrease of wall thickness is not permitted.

Test results cover width and depth ranges of mullions and transoms as given in Table 3. A decrease of width and /or depth of mullions and transom is not permitted. The values given in Table 3 refer to the factor the width and depth may be higher in comparison to the width and/or depth used in the test.

Table 3 — Factor for width and depth of mullions and transoms

Framing material	Classification E and EW				Classification EI			
	Transom		Mullion		Transom		Mullion	
	Width	Depth	Width	Depth	Width	Depth	Width	Depth
Aluminium	1,25 [a, c]	1,5 [b]	1,25 [a, c]	1,5	1,25 [a]	2 [b]	1,25 [a]	2
Steel	1,25	1,5 [b]	1,25	1,5	1,25	2 [b]	1,25	2
Stainless steel	1,25	1,5 [b]	1,25	1,5	1,25	1,5 [b]	1,25	1,5
Timber	2 [c]	1,5 [b]	2 [c]	1,5	2	4 [b]	2	4

[a] In case the transom or mullion contains a core material for the purpose of improving the fire resistance the dimensions of this core material shall be increased so that the contact area with the aluminium remains minimum the same and the overlap between the infill panel and the core material remains minimum the same.

[b] But maximum to the depth of the mullion.

[c] Provided the pressure plate system is changed accordingly so that the overlap remains the same subject to the rules given in 13.3.7.

13.3.3 Connection between mullions and transoms

13.3.3.1 Connection geometry

Figure 21 shows a cross connection, vertical T-connection, horizontal/standing and horizontal/hanging T-connection.

Test results for a cross-connection do not cover T-connections and vice versa.

A horizontal T-connection does not cover a vertical one and vice versa.

A standing T-connection does not cover a hanging T-connection and vice versa.

Test results for cross connections or T-connections with an angle of 90° between mullions and transoms cover situations where the angle between mullions and transoms is minimum 80° and maximum 100° disregarding whether the mullions are vertically oriented or not or the transoms are horizontally oriented or not. This rule also applies to corner connections of unitised systems.

13.3.3.2 Connection system between framing members

Test results for a particular connection system are only valid for connection systems of the same construction principle.

The dimensions of the connection system may be varied as required in relation to dimension changes of mullions and transoms according to 13.3.2.

13.3.4 Framing material

13.3.4.1 Metal framing

Test results for stainless steel apply to construction steel (unalloyed, low alloyed steel) but not vice versa.

Test results for steel do not apply to Aluminium and vice versa.

Test results apply only to the Aluminium alloy used in the test. Change to another Aluminium alloy is not permitted.

13.3.4.2 Timber framing

Test results for any solid or laminated timber type of a group according to Table 4 apply equally to all other timber types of the same group. Test results for any timber type of group 1 according to Table 4 apply equally to all other groups but not vice versa. Test results for any timber of group 2 according to Table 4 apply equally to all timber types of groups 3 and 4 but not vice versa. Test results for any timber of group 3 according to Table 4 apply equally to all timber types of group 4 but not vice versa.

Table 4 — Timber groups

Group	Timber type	Density (kg/m^3)
1	Softwood and beech	< 450
2	Hardwood excluding beech	< 450
3	Softwood and beech	≥ 450
4	Hardwood excluding beech	≥ 450

Test results for unprotected timber apply equally to protected timber but not vice versa. Test results for protected timber apply only to the type of protection used in the test. Protection means any measure, e.g. impregnation, varnish, coating or paint, intended to improve the reaction to fire classification according to EN 13501-1 or the K-classification according to EN 13501-2 of the timber.

13.3.5 Decorative frame surface treatments/coverings/coatings

Decorative frame surface treatments/coverings/coatings which achieve minimum class A2 according to EN 13501-1 together with the relevant frame component may be added or changed without restrictions.

Any decorative frame surface treatments/coverings/coatings with a thickness equal to or less than 1,5 mm may be added or changed without restrictions for curtain walling classified EI.

Decorative frame surface treatments/coverings/coatings of more than 1,5 mm thickness other than covered by the rule given in the first paragraph shall be included in the test as part of the test specimen. Test results of such decorative frame coverings/coatings apply only to decorative frame coverings/coatings made of the same material type and thickness.

Decorative frame surface treatments/coverings/coatings other than covered by the rule given in the first paragraph for curtain walling classified E or EW shall be included in the test as part of the test specimen. Test results of such decorative frame coverings/coatings apply to all types of decorative frame coverings/coatings of minimum the same reaction to fire class according to EN 13501-1 and of maximum the same thickness as used in the test if the framing system was at the unexposed side of the test specimen. Otherwise the results apply only to decorative frame coverings/coatings made of the same material type and thickness.

Test results for decorative frame surface treatments/coverings/coatings other than covered by the rule given in the first paragraph from a test for intended classification E may be also used for classification EW.

13.3.6 Fixing of the framing system (anchoring)

Fixing system made of Aluminium / Aluminium alloys: no change in material is permitted.

Test results for a fixing system made of aluminium / aluminium alloys covers steel but not vice versa.

Fixing system made of steel: change of alloy within construction steels (unalloyed / low alloy steels) is permitted.

Combinations of fixing positions in relation to the floor (in front, on top or below) and positions of the fixed and loose anchor (hanging or standing curtain walling) are covered by test results on a particular combination according to Table 5. Table 5 is applicable for internal exposure.

Test results on a particular fixing system type (anchored or cast-in or welded) are not applicable to another type.

Change in geometrical shape and/or linear dimensions within a fixing system type is permitted on the basis of a proper static calculation. The temperature at the fixing measured in the fire test shall be taken into account. If no temperature data of the fixing are available only increase in linear dimensions is permitted.

Test results for a non-insulated fixing system (not embedded in insulation material) apply equally to the same fixing system embedded in insulation material of reaction to fire class A1 or A2 according to EN 13501-1 but not vice versa.

Table 5 — Field of application rules for fixing positions

Tested ↓	Covered ➔										
	AF/AL	BF/BL	CF/AL	CF/BL	CF/CL	AL/AF	AL/BF	BL/BF	CL/AF	CL/BF	CL/CF
AF/AL		N	N	N	N	Y	N	N	N	N	N
AF/BL	Y	Y	N	N	N	Y	N	N	Y1	N	Y1
AF/CL	Y1	N	N	N	N	Y1	N	N	N	N	N
BF/AL	Y1	N	N	N	N	Y1	N	N	N	N	N
BF/BL	Y1		N	N	N	Y1	N	N	Y1	N	Y
BF/CL	Y1	N	N	N	N	Y1	N	N	N	N	N
CF/AL	Y	N		N	Y	Y	Y	Y	N	N	N
CF/BL	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
CF/CL	Y1	N	Y1	N		Y	Y	Y	N	N	N
AL/AF	Y	N	N	N	N		N	N	N	N	N
AL/BF	Y	N	N	N	N	Y		Y	N	N	N
AL/CF	N	N	N	N	N	N	N	N	N	N	N
BL/AF	N	N	N	N	N	N	N	N	N	N	N
BL/BF	Y1	N	N	N	N	Y1	Y1		N	N	N
BL/CF	Y1	N	N	N	N	Y1	N	N	N	N	N
CL/AF	Y	Y	N	N	N	Y	N	N		N	Y
CL/BF	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y
CL/CF	Y1	Y	N	N	N	Y1	N	N	Y1	N	

A Fixing in front of the floor (see Figure 22)

B Fixing on top of the floor (see Figure 22)

C Fixing on bottom of the floor (see Figure 22)

F Fixed bearing

L Floating bearing (to allow thermal extension)

N not covered

Y covered without restriction

Y1 covered, provided the fixing is completely made of steel

The first position indicates the type of fixing on the upper floor, the second position the type of fixing on the lower floor, e. g.:

AF/BL: Fixed bearing in front of the floor used on the upper floor / floating bearing on top of the floor used on the lower floor (hanging curtain walling)

AL/BF: Floating bearing in front of the floor used on the upper floor / fixed bearing on top of the floor used on the lower floor (standing curtain walling)

For further explanation see B.7.6.3.

13.3.7 Pressure plate system

13.3.7.1 Edge cover / overlap of pressure plate

Results from tests with a smaller edge cover / overlap of the pressure plate on the infill panel are also valid for a higher edge cover / overlap but not vice versa. This rule applies for both, the outer and inner edge cover (Figure 20). This rule does not apply to fire resistant translucent or transparent infill panels with E or EW classification.

13.3.7.2 Size of pressure plate

Smaller and higher widths of the pressure plate are covered provided the moment of inertia of the pressure plate in the axis as shown in Figure 20 is minimum the same as tested and the overlap is minimum the same as tested subject to the rules given in 13.3.7.1.

13.3.7.3 Material of pressure plate

Results for aluminium pressure plates are also valid for steel pressure plates of the same width, but not vice versa. The flexural strength of the pressure plate shall be equal or higher than the flexural strength used in the test.

13.3.7.4 Screws

The screws shall have minimum the same effective screw depth (i.e. depth in the mullion/transom) and minimum the same cross section as used in the test. The distance between the screws may be reduced but not increased.

13.3.7.5 Mullion and transom cover cap

Test results on any cover cap are equally valid for all other types of cover plates of minimum the same classification according to EN 13501-1, subject to maximum the same width in case of classifications E and EW.

13.3.8 Other fixing systems than pressure plate

Test results are only applicable to the fixing system used in the test.

Results from tests with a smaller edge cover / overlap of the fixing system on the infill panel are also valid for a higher edge cover / overlap but not vice versa. This rule applies for both, the outer and inner edge cover. This does not apply to fire resistant translucent or transparent infill panels with E or EW classification.

13.4 Infill panels

13.4.1 Opaque (non-translucent/non-transparent) infill panels

13.4.1.1 Type / construction

Test results cover only the type / construction of the infill panel(s) used in the test.

13.4.1.2 Dimensions

Test results cover smaller panel width and height.

Test results cover a higher thickness of the panel.

Test results cover a higher thickness of the panel insulation.

Test results for an infill panel of particular dimensions cover dimensions up to a maximum of the tested dimension multiplied by a factor 1,2 in width and/or height but only up to an area of maximum the tested area multiplied by a factor 1,21 provided an overrun time according to Table 2 has been achieved in the test.

For classification times 30 min, 45 min and 60 min a factor 1,1 may be used to calculate the covered range of height, width and area, if the overrun time achieved in the test is less than the 6 min required in Table 2 but minimum 3 min.

For a classification time ≥ 90 min a factor 1,1 may be used to calculate the covered range of height, width and area, if the overrun time achieved in the test is less than the 10 % required in Table 2 but minimum 5 %.

Test results cover smaller distances in between fixing centres, vertical and horizontal.

13.4.1.3 Aspect ratio of individual infill panels

Test results for rectangular panels with portrait as well as landscape format cover all aspect ratios subject to the rules given in 13.4.1.2 provided that all panels have been tested in an identical framing system.

13.4.1.4 Geometrical shapes

Test results for a rectangular panel cover all other shapes provided that their size can be cut out of the tested rectangular size, subject to the rules given in 13.3.3.1.

13.4.1.5 Materials

Test results of gypsum plasterboards except gypsum plasterboards type F according to EN 520 are valid for all types of gypsum plasterboards provided the thickness is minimum the same. Test results of gypsum plasterboards type F according to EN 520 are not valid for other types of gypsum plasterboard. Test results of all types of gypsum plasterboards apply equally to boards made of CaSi boards but not vice versa provided the thickness is minimum the same. Test results of boards made of CaSi are only valid for CaSi boards.

The thickness of the board may be increased.

Test results of a non-faced mineral wool board are equally applicable to an aluminium faced version of this mineral wool board but not vice versa.

The insulation material as used in the test shall not be changed.

The thickness of the insulation may be increased.

The type of fixing of the components to each other (e.g. gluing) shall not be changed.

External layers for optical reasons (e.g. metal, stone, concrete, glass) may be added or changed without restriction to the material.

Increased weight of the infill panels as a result of changes according to the rules above shall be considered for the anchoring, the dimensioning of mullions and transoms and the fixing system for the panels.

13.4.1.6 Back panel metal sheeting

Change of thickness of metal sheeting is not permitted.

13.4.2 Sandwich panels

The thickness of the insulation material may be increased.

Change in thickness of metal sheeting is not permitted.

Increased weight of the infill panels as a result of changes according to the rules above shall be considered.

13.4.3 Translucent or transparent infill panels

13.4.3.1 Type of fire resistant translucent or transparent infill panel

13.4.3.1.1 General

Three major types of fire resistant translucent or transparent infill panels were identified:

— a fire resistant translucent or transparent infill panel consisting only of the glass component that gives the fire resistance; this may be a monolithic pane, a laminated pane or a gel type glass depending on the required classification (E, EW or EI), indicated A in Figure 23

  — an IGU consisting of the part that gives the fire resistance and a single pane for UV/acoustic/safety performance (counter pane), with or without additional coatings on either side of the counter pane, indicated B in Figure 23 (example shown with coating inside)

  — an IGU consisting of the part that gives the fire resistance and a laminated pane for UV/acoustic/safety performance (counter pane), with or without additional coatings on either side of the counter pane, indicated C in Figure 23 (example shown with coating inside)

13.4.3.1.2 Classification EI (i → o)

Test results of type A are equally applicable to type B and C but not vice versa.

Test results of type B are equally applicable to type C and vice versa.

Test results of type B without additional coatings are equally applicable to type B with additional coatings but not vice versa.

Test results of type C without additional coatings are equally applicable to type C with additional coatings but not vice versa.

NOTE For details see Figure 23.

13.4.3.1.3 Classification EI (o → i)

Test results of type C are equally applicable to type B but not vice versa.

Test results of type B without additional coatings are equally applicable to type B with additional coatings and vice versa.

Test results of type C without additional coatings are equally applicable to type C with additional coatings and vice versa.

Test results of type C with additional coatings are equally applicable to type B without additional coatings but not vice versa.

NOTE For details see Figure 23.

13.4.3.1.4 Classification E, EW

No rules applicable.

13.4.3.1.5 Provisions

All rules given in 13.4.3.1.2 and 13.4.3.1.3 are valid only provided

— the glass component that gives the fire resistance is of the same type (monolithic, laminated or gel type) as tested and is made by the same manufacturer, and

— the fire resistant translucent or transparent infill panel is CE marked based on a classification according to EN 13501-2 in minimum one glazed construction.

13.4.3.2 Dimensions of individual rectangular fire resistant translucent or transparent infill panels

Test results cover smaller panel width and height.

Test results cover a higher thickness of the panel.

The framing system under consideration shall be able to support the additional weight due to the increased thickness of the panel.

Test results for a panel of particular dimensions cover dimensions up to a maximum of the tested dimension multiplied by a factor 1,2 in width and/or height but only up to an area of maximum the tested area multiplied by a factor 1,21 provided an overrun time according to Table 2 has been achieved in the test.

For classification times 30 min, 45 min and 60 min a factor 1,1 may be used to calculate the covered range of height, width and area, if the overrun time achieved in the test is less than the 6 min required in Table 2 but minimum 3 min.

For a classification time ≥ 90 min a factor 1,1 may be used to calculate the covered range of height, width and area, if the overrun time achieved in the test is less than the 10 % required in Table 2 but minimum 5 %.

For fire resistant translucent or transparent infill panels with EW classification the rules given above are only applicable if

— the mean unexposed face temperature remained below 300° C (see EN 1363-2), or

— the test specimen was glazed over its full area and the measured radiation did not exceed 12,5 kW/m^2 (for further explanation see B.7.7.1).

13.4.3.3 Aspect ratio of individual rectangular fire resistant translucent or transparent infill panels

Test results for rectangular translucent or transparent infill panels with portrait as well as landscape format cover all aspect ratios up to an area $A \leq 1/2 * (A_{portrait} + A_{landscape})$ provided that

— all translucent or transparent infill panels have been tested in an identical framing system,

— the largest tested width as well as the largest tested height is not exceeded.

In case an overrun time has been achieved according to Table 2 the values for $A_{portrait}$ and $A_{landscape}$ may be determined by using the rules for dimensions given in 13.4.3.2.

13.4.3.4 Geometrical shapes

Test results for a rectangular translucent or transparent infill panel cover all other shapes provided that their size can be cut out of the tested rectangular size subject to the rules given in 13.3.3.1.

13.4.3.5 Asymmetry in thickness

If the translucent or transparent infill panel is asymmetrical in an axis perpendicular to the surface the test result is only valid for the direction and type of exposure (internal or external exposure) as tested.

13.4.4 Glazing materials

13.4.4.1 Gaskets

13.4.4.1.1 General

Gaskets with a higher material cross sectional area in the uncompressed state cover gaskets with a smaller cross sectional area but not vice versa. The cross sectional area in the uncompressed state may be increased by maximum 50 % compared to what was tested.

Test results from particular gasket geometry are also applicable to other geometries. In case of curtain walling classified E or EW no material addition (e.g. lips) is permitted on the side of the gasket that is visible in the built-in situation.

Test results cover only the gasket material used in the test.

13.4.4.1.2 Sealants

Change in type of material (e.g. acrylic, silicone) is not permitted.

Test results cover a lower sealant height (for definition see Figure 20) and a higher sealant height up to a maximum of 1,2 times the height used in the test.

The sealant depth (for definition see Figure 20) shall be minimum the same as tested.

13.4.4.1.3 Intumescent strips/layers

Changes to intumescent strips/layers are not permitted.

13.5 Perimeter seals / Vertical linear joint seals

13.5.1 General

Perimeter seals tested according to this standard shall not be used where in practice movement of the perimeter joint is expected.

NOTE For information on test requirements for perimeter seals in case of required movement capability see B.7.8.

13.5.2 Orientation

Results from tests on perimeter seals (horizontal linear gap seals) are only valid for perimeter seals. Results from tests on vertical linear gap seals are only valid for vertical linear gap seals.

13.5.3 Material

Test results for non-faced mineral wool are equally applicable to an aluminium faced version of the same mineral wool product (brand designation) but not vice versa.

Test results for mineral wool are valid for a version with higher density of the same mineral wool product (brand designation) as long as it is compressible to the same extent as in the test, subject to restrictions depending on the direction of compression given in 13.5.5.4.

Test results for compressed mineral wool are equally applicable to mineral wool of higher compression, subject to restrictions depending on the direction of compression given in 13.5.5.4.

Changes to other materials or components are not permitted.

13.5.4 Width/depth

For definition of width and depth of the perimeter seal see Figure 22. For definition of width and depth of the vertical linear gap seal see Figure 7C.

Test results for linear joint seals or seal components with lower depth are equally applicable to linear joint seals with higher depth but not vice versa. For membrane forming coatings and elastomeric strips the results apply for all thicknesses within the tolerance band for the membrane/strip and higher depth of mineral wool (or other backing material).

Test results for linear joint seals with higher nominal width are equally applicable to linear joint seals with narrower nominal width but not vice versa, subject to the depth of the seal or its components being minimum the same as tested and subject to the rules regarding compression (see 13.5.5.4). For membrane forming coatings and elastomeric strips the overlap on the floor and the spandrel shall be in practice minimum the same as tested.

Test results for linear joint seals with an overrun according to Table 2 cover a nominal width range up to 1,2 times the tested nominal width, except for products with distinct sizes for specific gap widths and preformed products which are kept in place by compression (no additional mechanical fixing provided).

In case an intumescent sealant is used as component of the perimeter seal its depth may be increased. For definition of depth see Figure 22.

13.5.5 Fixing of the perimeter seal

13.5.5.1 For mechanically fixed seals the fixing of the perimeter seal is restricted to the fixing used in the test.

13.5.5.2 For self-adherent seals or seal components, e.g. membrane forming coatings and sealants, as well as for adhesion fixed seals or seal components, e.g. elastomeric strips, the results apply for all substrates for which the adhesion is shown to be equal to or better than that in the fire test.

NOTE An example for adhesion fixing is the use of a glue to fix the seal or seal component.

13.5.5.3 For friction fixed seals or seal components, e.g. mineral wool and compressible strips, minimum the same compression shall be used in practice as used in the test, subject to the following rule.

13.5.5.4 For mineral wool with compression direction B-B or C-C according to Figure 24 the compression shall be minimum the same as tested but sufficiently low not to induce a mechanical failure of the seal, e.g. by de-lamination fracture.

13.5.6 Covering

Tests without steel sheet covering cover perimeter seal systems including steel sheet covering, provided it is not force-fit fixed to the curtain walling, disregarding whether the steel sheet covering is installed on top or on bottom of the seal, but not vice versa.

Test results are only valid for the covering material used in the test.

No additional coverings of reaction to fire classification B to F according to EN 13501-1 are permitted on bottom side of perimeter seals and on both sides of vertical linear gap seals.

13.6 Supporting floor

Test results obtained with the standard supporting floor construction may be applied to concrete floors of a thickness and density equal to or greater than that of the floor construction used in the test.

The test results of a curtain walling specimen tested in front of a non-standard supporting floor are valid for other floors of the same type provided the thickness as well as the fire resistance with respect to loadbearing capacity, integrity and insulation of these floors are equal to or greater than that of the non-standard floor used in the test.

13.7 Walls abutting the curtain walling

Test results obtained with rigid standard wall constructions according to 7.3.1 may be applied to concrete or masonry separating wall constructions of a thickness and density equal to or greater than that of the wall construction used in the test.

Test results obtained with a standard flexible wall construction cover all flexible wall constructions of the same fire resistance classification provided:

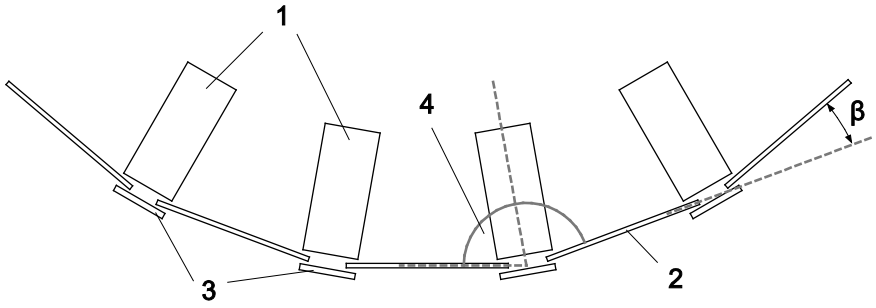
— the construction is classified in accordance with EN 13501-2;

— the stud depth is higher than that used in the test, subject to the rules given in EN 1363-1;

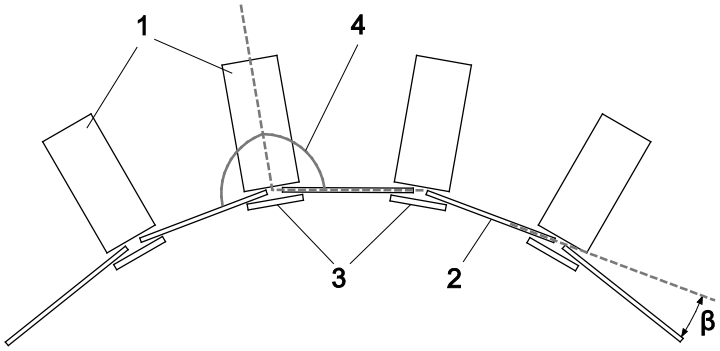
— the number of board layers and the overall board layer thickness is equal or greater than that tested when no aperture framing on the joint face is used;

— flexible wall constructions with timber studs are constructed with at least the same number of layers as used in the test, no part of the joint seal is closer than 100 mm to a stud, the cavity is closed between the joint seal and the stud, and minimum 100 mm of insulation of class A1 or A2 according to EN 13501-1 is provided within the cavity between the joint seal and the stud.

A



B



Key

A case 1: angle between horizontally adjacent infill panels < 180° (horizontal section)

B case 2: angle between horizontally adjacent infill panels > 180° (horizontal section)

1 mullion

2 infill panel

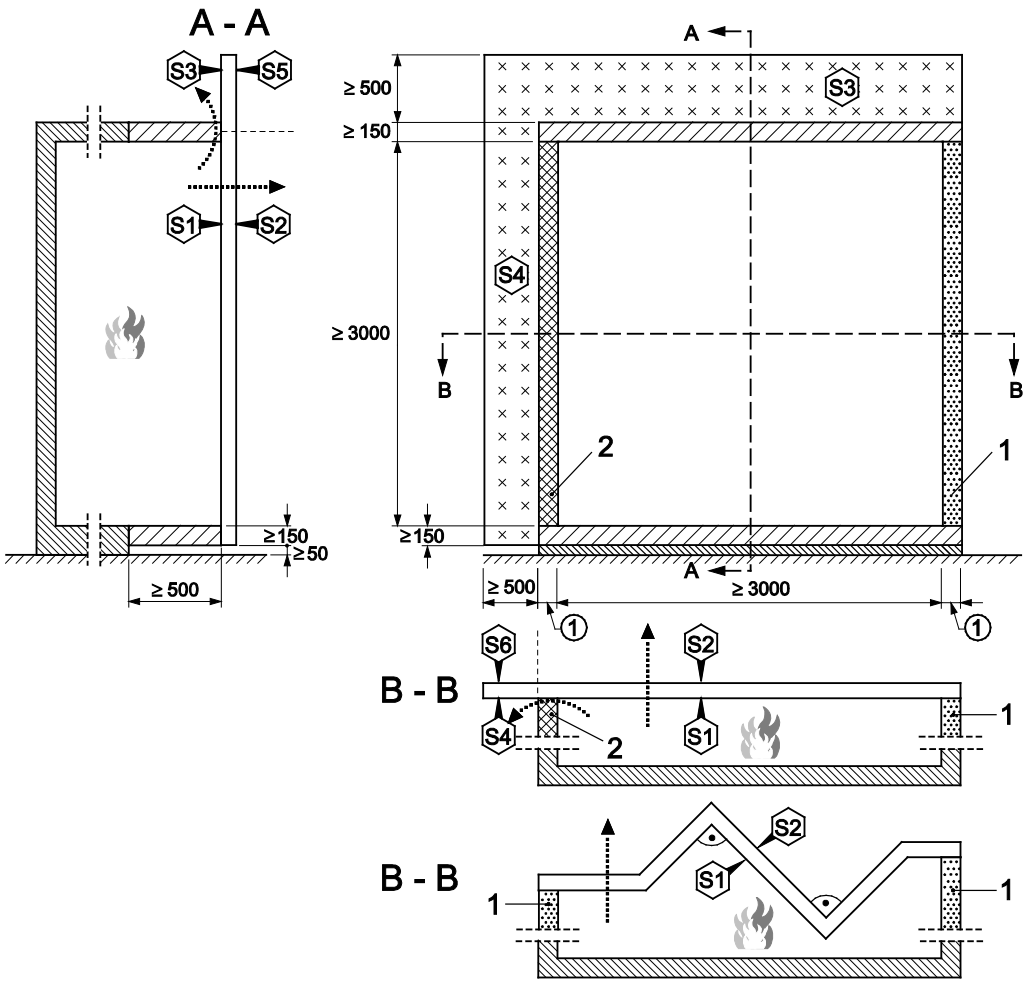
3 pressure Plate

4 angle between horizontally adjacent infill panels at the common mullion

β facet angle

Figure 1 — Horizontally faceted curtain walling

Dimensions in millimetres

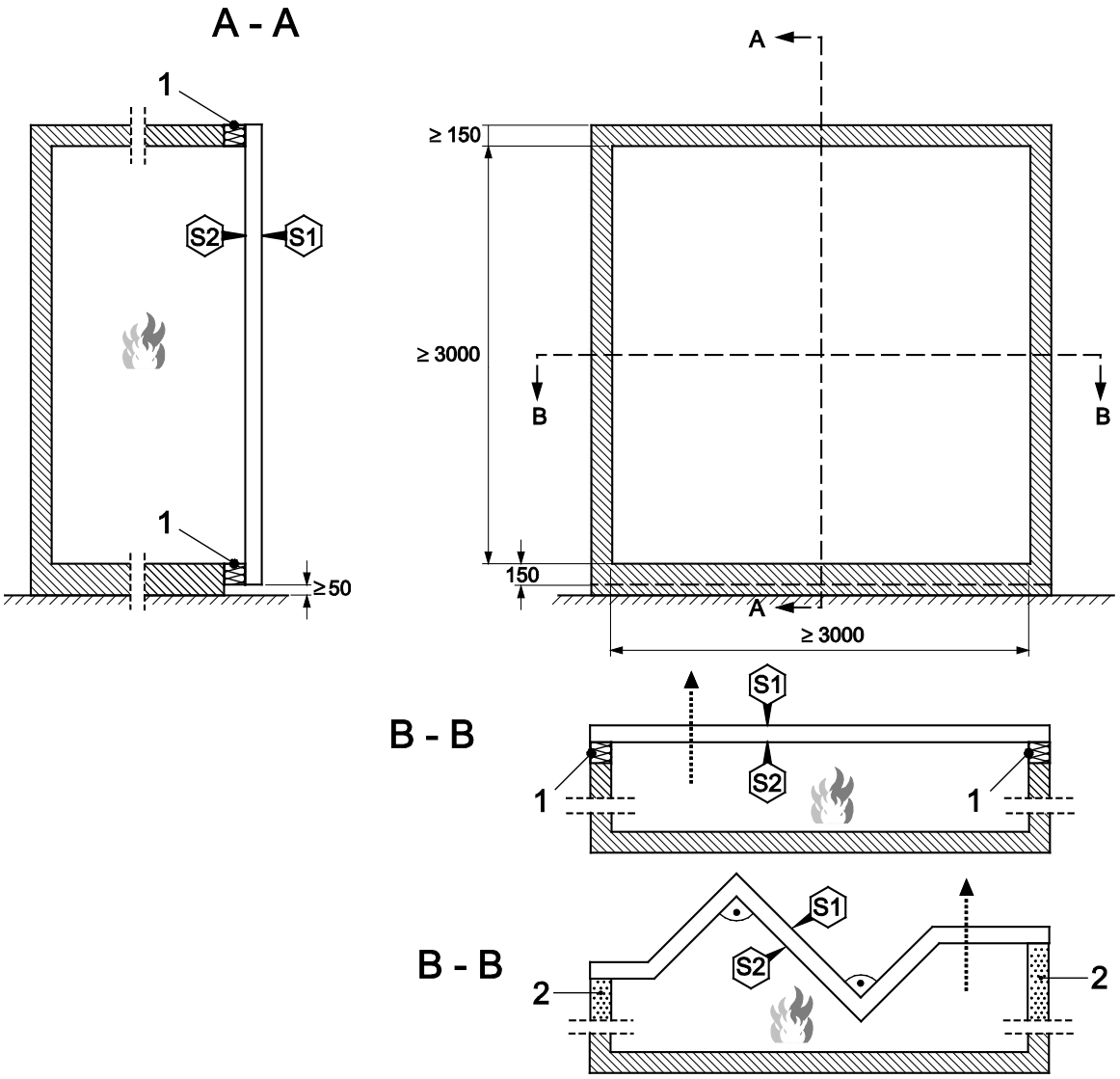


Key

	furnace
	supporting floor (see 7.2)
①	depends on the wall construction selected
1	associated wall
2	simulated wall (optional)
A-A	vertical section
B-B	horizontal section
S1	surface 1
S2	surface 2 (external face of the curtain walling)
S3	surface 3
S4	surface 4
S5	surface 5
S6	surface 6

Figure 2 — Definition of surfaces for internal exposure – view from inside the furnace

Dimensions in millimetres



Key

furnace

1 furnace closure according to 7.4

2 associated wall

A-A vertical section

B-B horizontal section

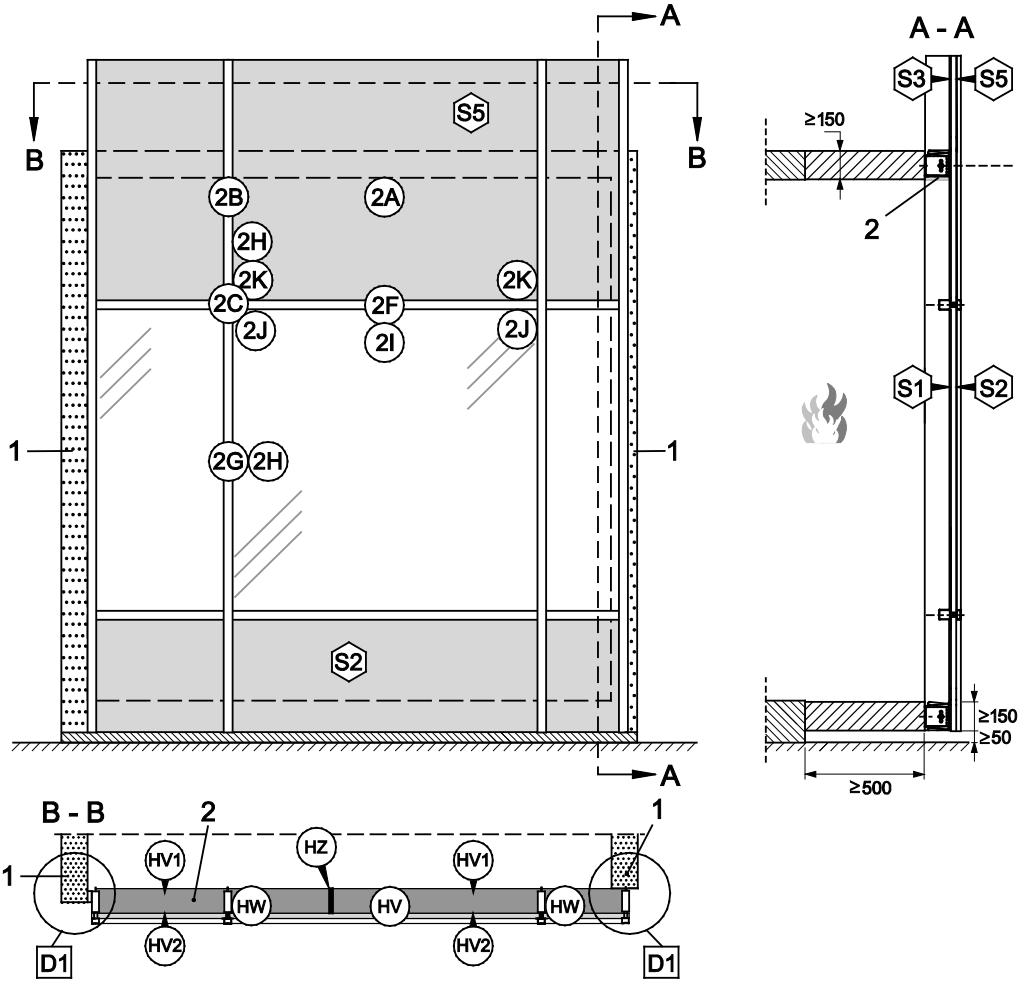
S1 surface 1

S2 surface 2 (external face of the curtain walling)

NOTE Example of installation in front of the furnace shown. Supporting structure for specimen shown in Figure 9.

Figure 3 — Definition of surfaces for external exposure – view from inside the furnace

Dimensions in millimetres

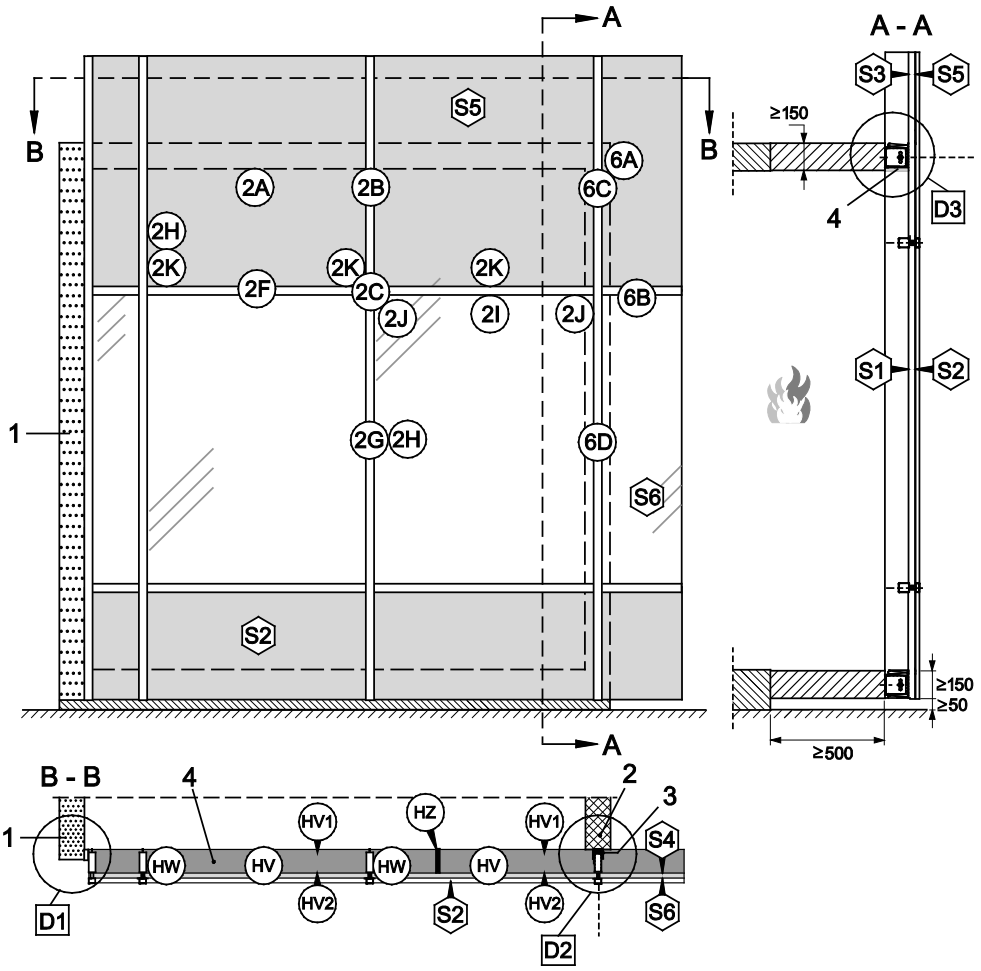


Key

	supporting floor (see 7.2)
	Furnace
	splice
1	associated wall
2	perimeter seal
2A to 2K	thermocouples on Surface 2
A-A	vertical section
B-B	horizontal section (showing thermocouples at the perimeter seal)
D1	for detail see Figure 7
HV, HV1, HV2, HW	thermocouples on the perimeter seal
HZ	splice thermocouple
S1 to S5	surfaces 1 to 5

Figure 4 — Location of the thermocouples (maximum temperature rise) for internal exposure – straight specimen, view from outside the furnace

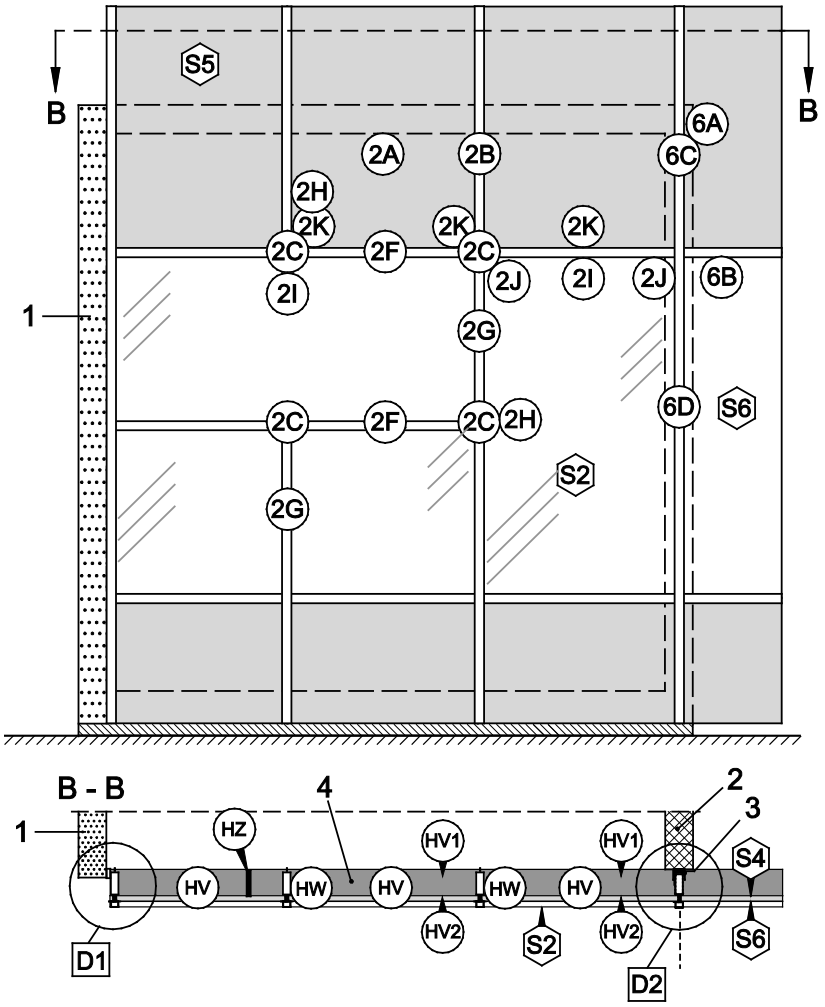
Dimensions in millimetres



Key

	furnace
	supporting floor (see 7.2)
	splice
1	associated wall
2	simulated wall
3	vertical linear gap seal
4	perimeter seal
2A to 2K	thermocouples on Surface 2
6A to 6D	thermocouples on Surface 6
A-A	vertical section
B-B	horizontal section (showing thermocouples at the perimeter seal)
D1 and D2	for detail see Figure 7
D3	for detail see Figures 18 and 19
HV, HV1, HV2, HW	thermocouples on the perimeter seal
HZ	splice thermocouple
S1 to S6	surfaces 1 to 6

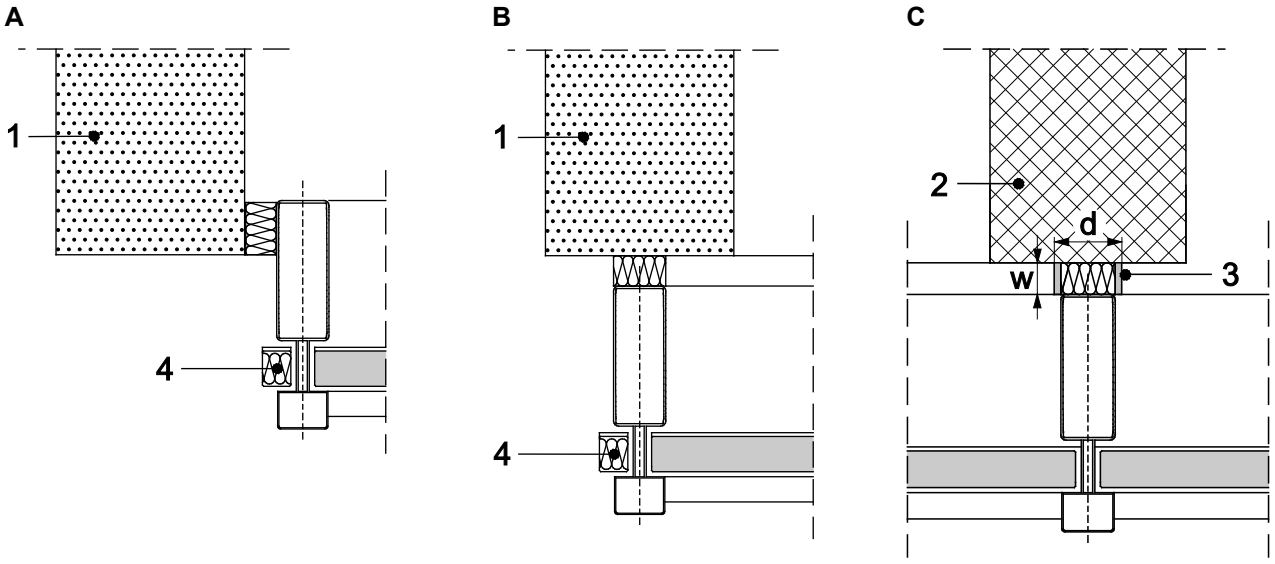
Figure 5 — Location of the thermocouples (maximum temperature rise) for internal exposure – straight specimen including a vertical linear gap seal, view from outside the furnace



Key

	furnace
	splice
1	associated wall
2	simulated wall (optional)
3	vertical linear gap seal
4	perimeter seal
2A to 2K	thermocouples on Surface 2
6A to 6D	thermocouples on Surface 6
A-A	vertical section
B-B	horizontal section (showing thermocouples at the perimeter seal)
D1 and D2	for detail see Figure 7
HV, HV1, HV2, HW	thermocouples on the perimeter seal
HZ	splice thermocouple
S1 to S6	surfaces 1 to 6

Figure 6 — Location of the thermocouples (maximum temperature rise) for internal exposure – straight specimen including horizontal and vertical T-connection, view from outside the furnace



Key

A option A for Detail D1 from Figures 4 to 6 – mullion installed inside furnace abutting an associated wall – free edge in the sense of 6.3.3

B option B for Detail D1 from Figures 4 to 6 – mullion installed in front of furnace abutting an associated wall – unrestrained but not free edge in the sense of 6.3.3

C detail D2 from Figures 5 and 6 – specimen with vertical gap seal and simulated wall – unrestrained but not free edge in the sense of 6.3.3

1 associated wall

2 simulated wall

3 vertical linear gap seal

4 furnace closure according to 7.4 to prevent buckling of the mullion

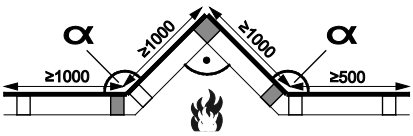
d depth of vertical linear gap seal

w nominal width of vertical linear gap seal

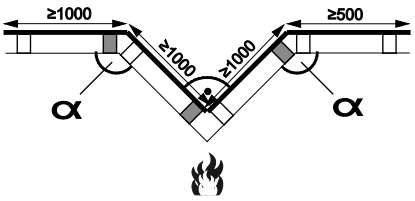
Figure 7 — Details for the connection of the mullion to the associated wall or simulated wall

Dimensions in millimetres

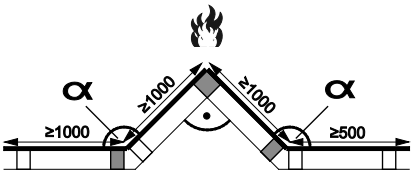
Test configuration A: i → o



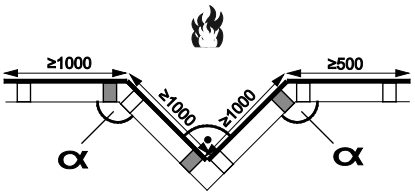
Test configuration B: i → o



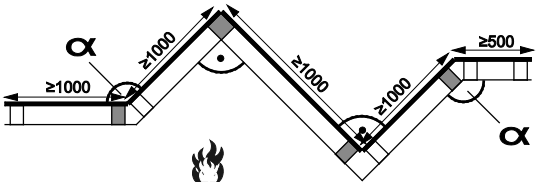
Test configuration C: o → i



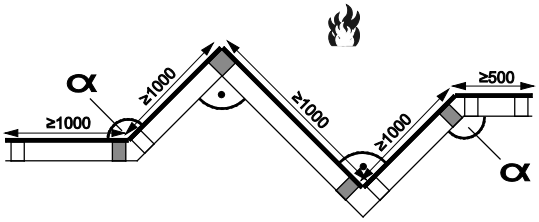
Test configuration D: o → I



Test configuration E: i → o



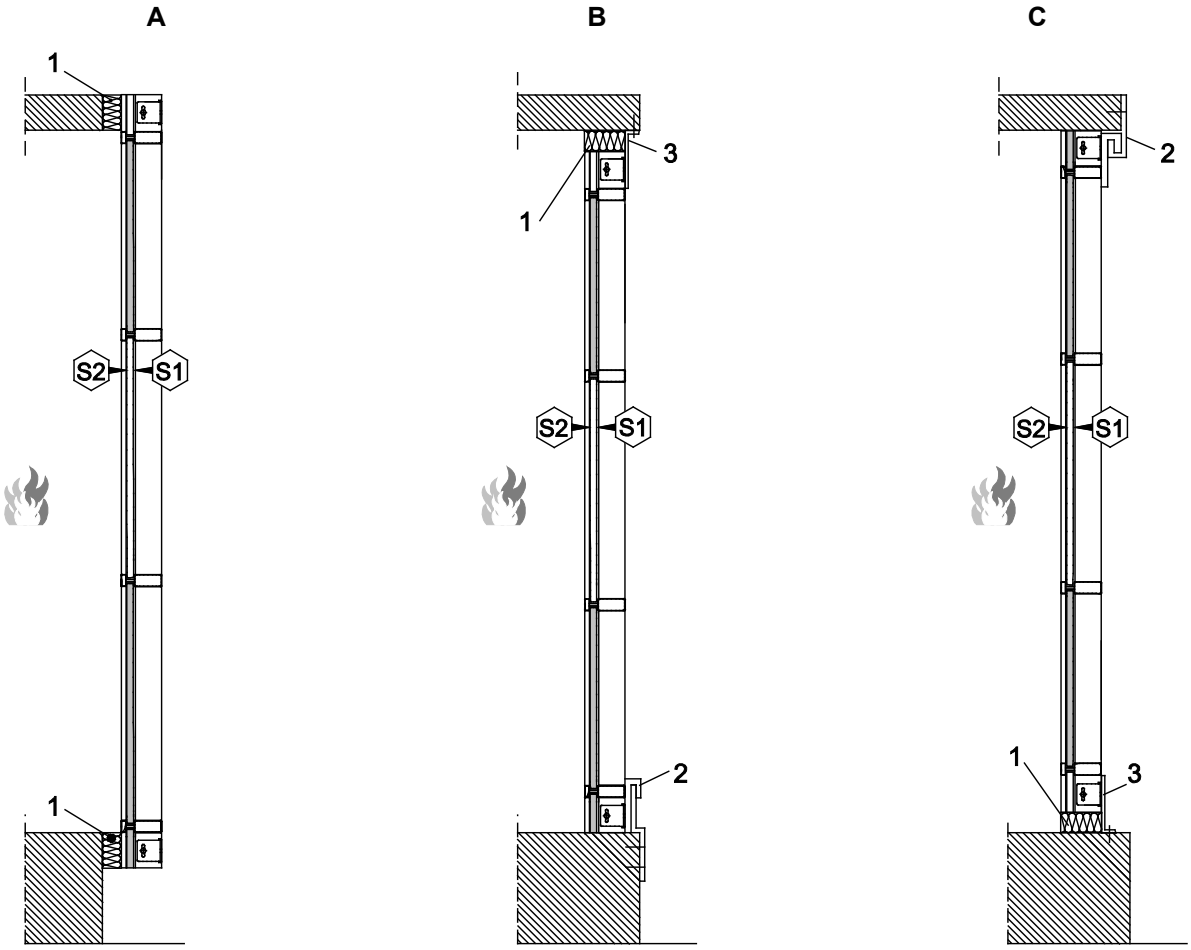
Test configuration F: o → I



Key

	mullion with thermocouples
	mullion without thermocouples
A	convex corner, internal exposure
B	concave corner, internal exposure
C	convex corner, external exposure
D	concave corner, external exposure
E	combination of A and B
F	combination of C and D
α	angle of 135°

Figure 8 — Options for the configuration of faceted specimens, horizontal section



Key

furnace / test frame

A installation in front of the furnace using a supporting frame

B installation inside the furnace – standing curtain walling (rigid fixing of the framing system bottom)

C installation inside the furnace – hanging curtain walling (rigid fixing of the framing system on top)

1 class A1 material to close the gap between the furnace and the specimen

2 rigid fixing of the framing system

3 fixing of the framing system and furnace closure allowing thermal expansion of the test specimen

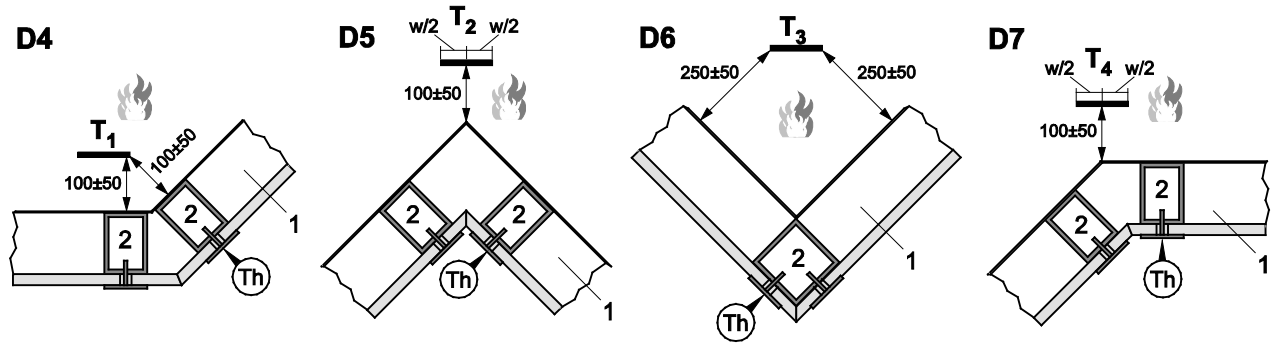
S1 surface 1

S2 surface 2 (external face of the curtain walling)

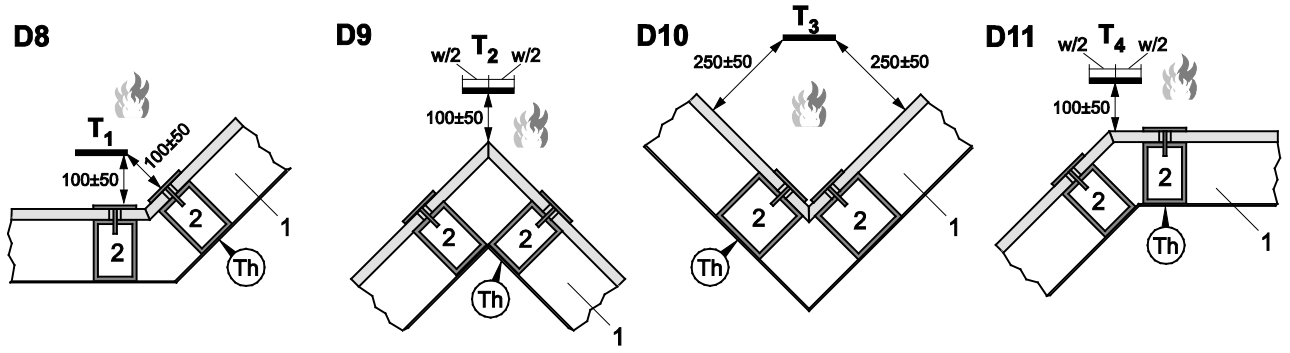
Figure 9 — Installation alternatives for specimens with external exposure

Dimensions in millimetres

A



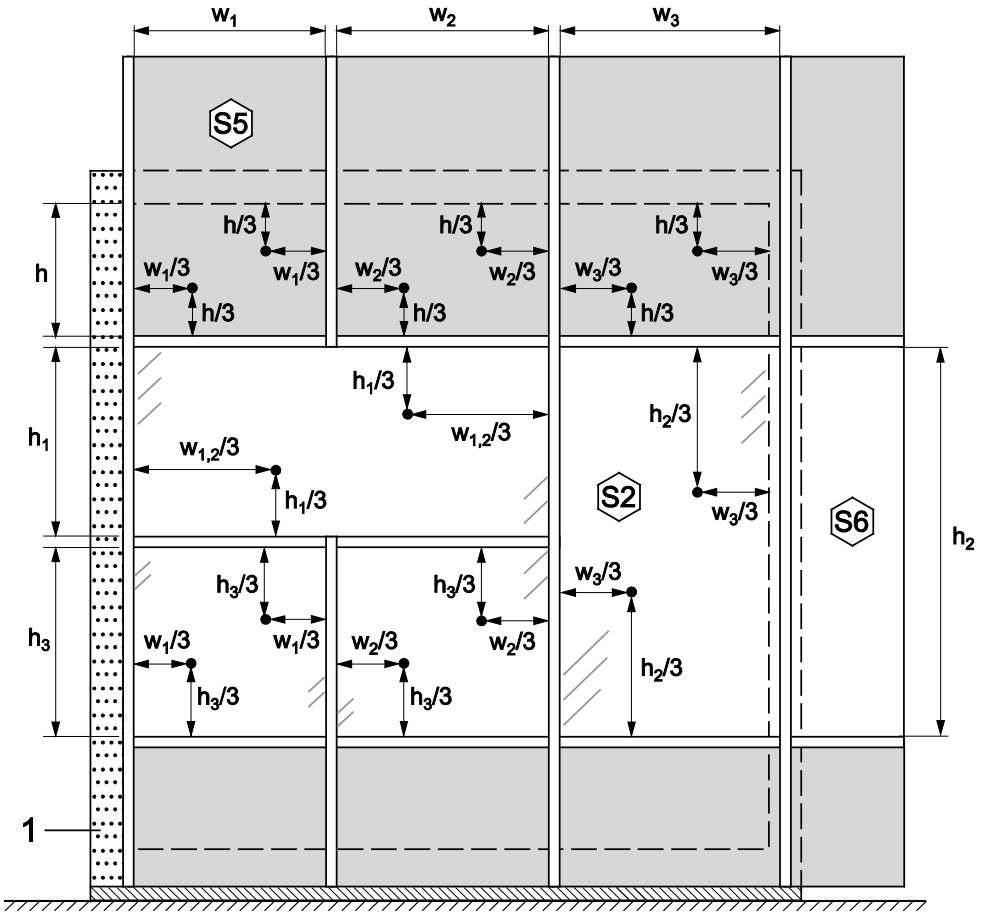
B



Key

A	internal exposure
B	external exposure
D4	convex angle between horizontally adjacent infill panels - detail D4 from Figure 13
D5	concave corner - detail D5 from Figure 13
D6	convex corner - detail D6 from Figure 13
D7	concave angle between horizontally adjacent infill panels - detail D7 from Figure 13
D8	concave angle between horizontally adjacent infill panels - detail D8 from Figure 12
D9	convex corner - detail D9 from Figure 12
D10	concave corner - detail D10 from Figure 12
D11	convex angle between horizontally adjacent infill panels - detail D11 from Figure 12
1	perimeter seal
2	mullion
T1 – T4	furnace thermometers
Th	position of thermocouples 2B, 2C and 2G
NOTE	Type of mullions shown is only an example.

Figure 10 — Details of the corner / facet angle construction and location of furnace thermometers– faceted specimen

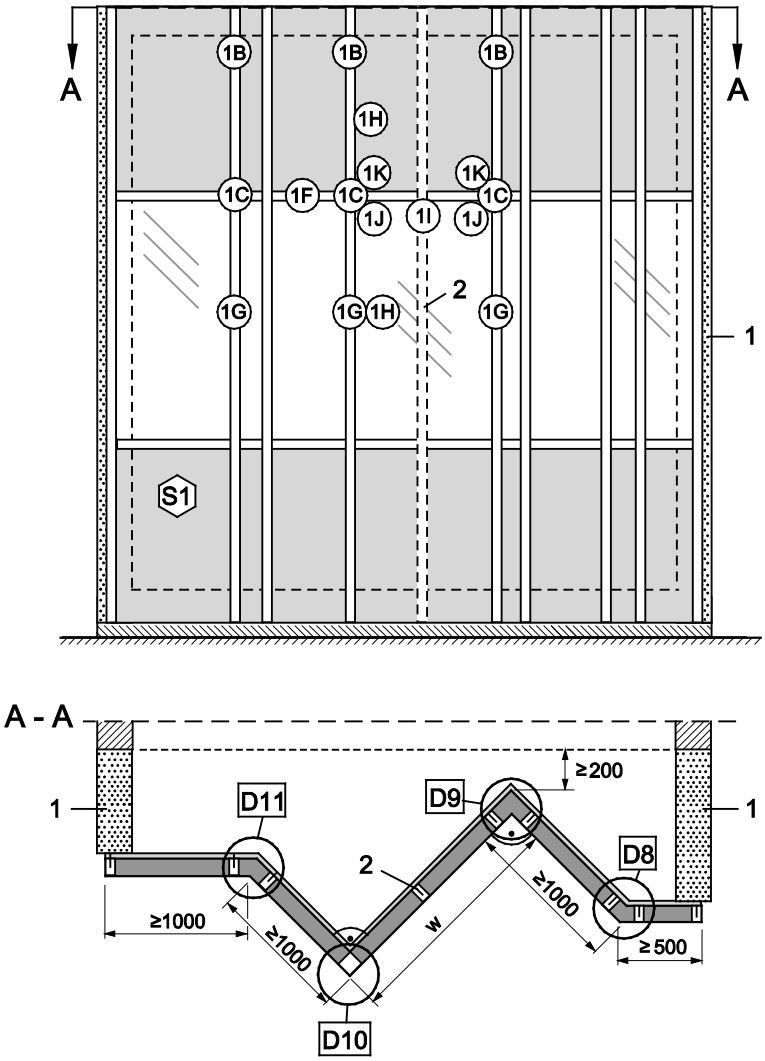


Key

	furnace
	location of thermocouples
1	associated wall
S2, S5, S6	surfaces 2, 5 and 6

Figure 11 — Location of thermocouples (mean temperature rise) on the example of Surface S2, straight specimen

Dimensions in millimetres



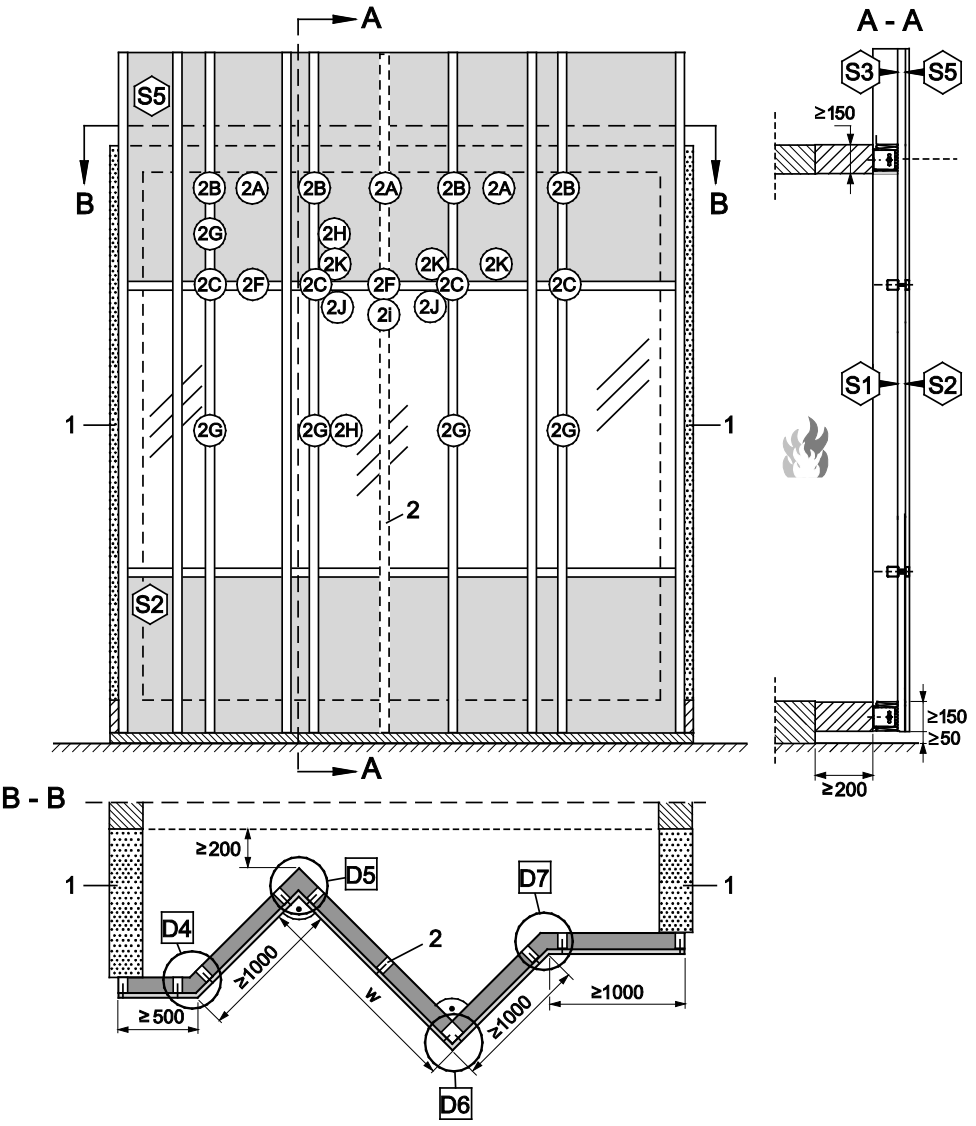
Key

	furnace
1	associated wall
2	optional mullion
1A to 1K	thermocouples on Surface 1
A-A	vertical section
D8 to D11	for details see Figure 10
S1	surface 1
w	width of the panel; may be varied to allow adjustment of the specimen to the furnace needs; minimum 1000 mm

NOTE Combination specimen according to Figure 8F shown as example.

Figure 12 — Location of the thermocouples (maximum temperature rise) for external exposure – faceted specimen, view from outside the furnace

Dimensions in millimetres

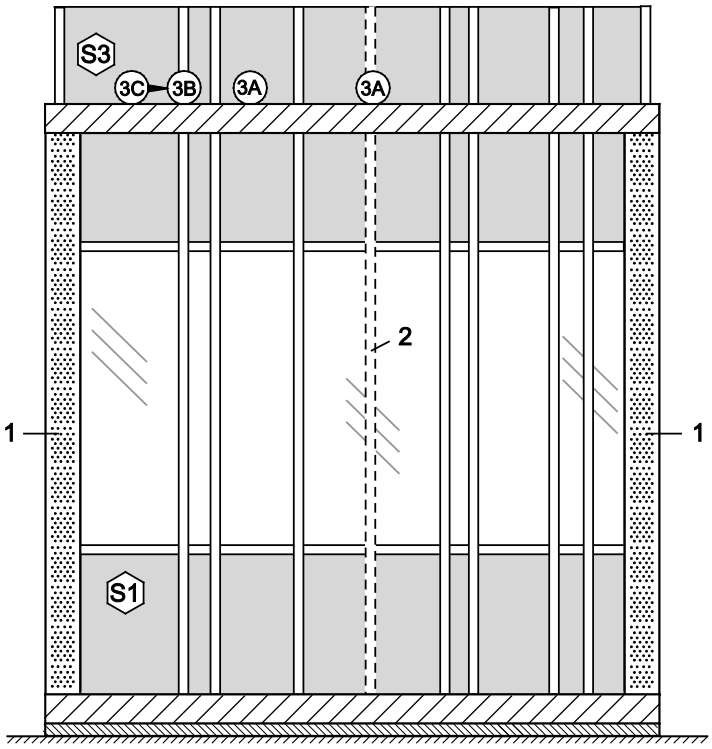


Key

	furnace
	supporting floor (see 7.2)
1	associated wall
2	optional mullion
2A to 2K	thermocouples on Surface 2
A-A	vertical section
D4 to D7	for details see Figure 10
B-B	horizontal section
S1, S2, S5	surfaces 1, 2 and 5
w	width of the panel; may be varied to allow adjustment of the specimen to the furnace needs; minimum 1000 mm

NOTE Combination specimen according to Figure 8E shown as example.

Figure 13 — Location of the thermocouples (maximum temperature rise) for internal exposure – faceted specimen, view from outside the furnace



Key

furnace

supporting floor (see 7.2)

1 associated wall

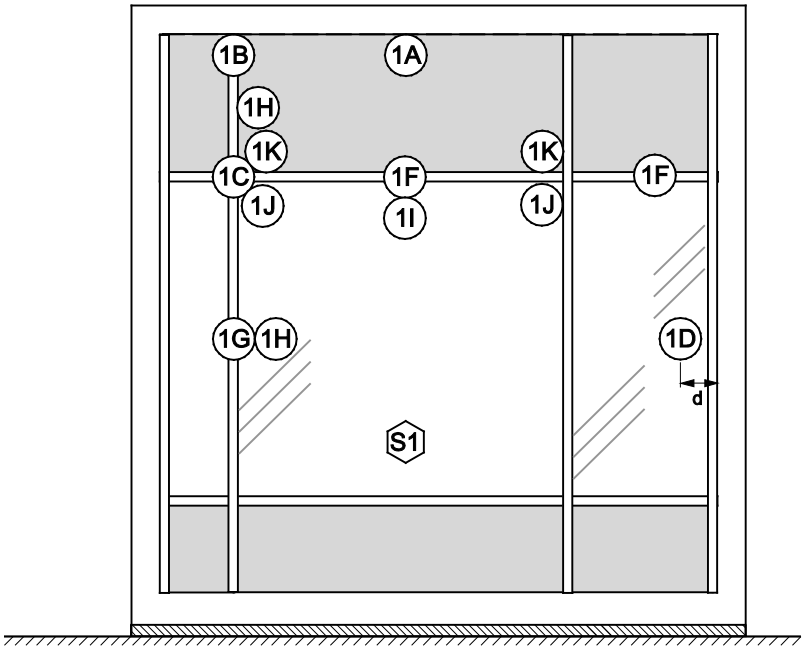
2 optional mullion

3A to 3C thermocouples on Surface 3

S1, S3 surfaces 1 and 3

NOTE Combination specimen according to Figure 8E shown as example.

Figure 14 — Location of the thermocouples (maximum temperature rise) for internal exposure – faceted specimen, view from inside the furnace



Key

furnace

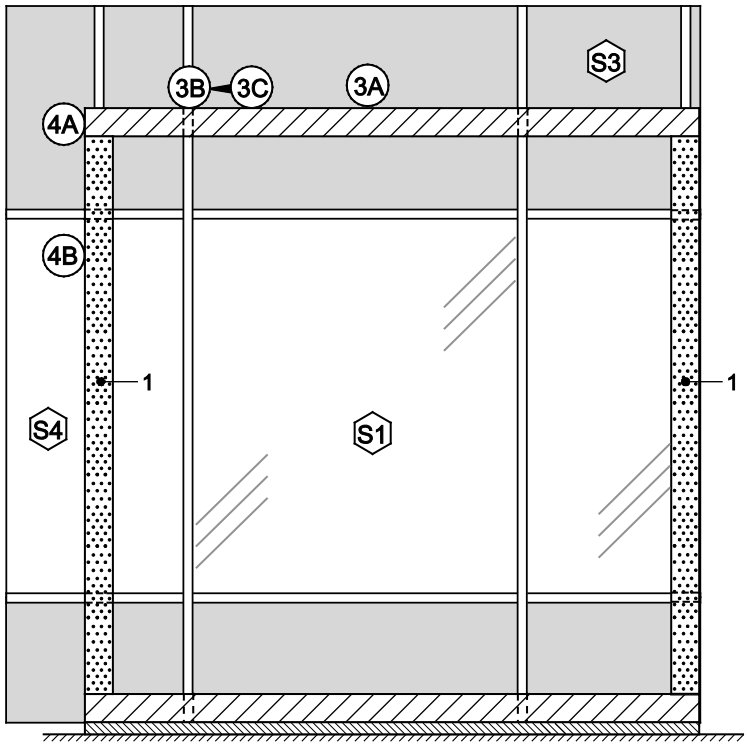
parts of the specimen only used when installed in front of the furnace (see Figure 9A)

1A to 1K thermocouples on Surface 1

d 150 mm from the panel edge in case of installation according to Figure 9B and 9C, 150 mm from the inner furnace wall surface in case of installation according to Figure 9A.

S1 surface 1

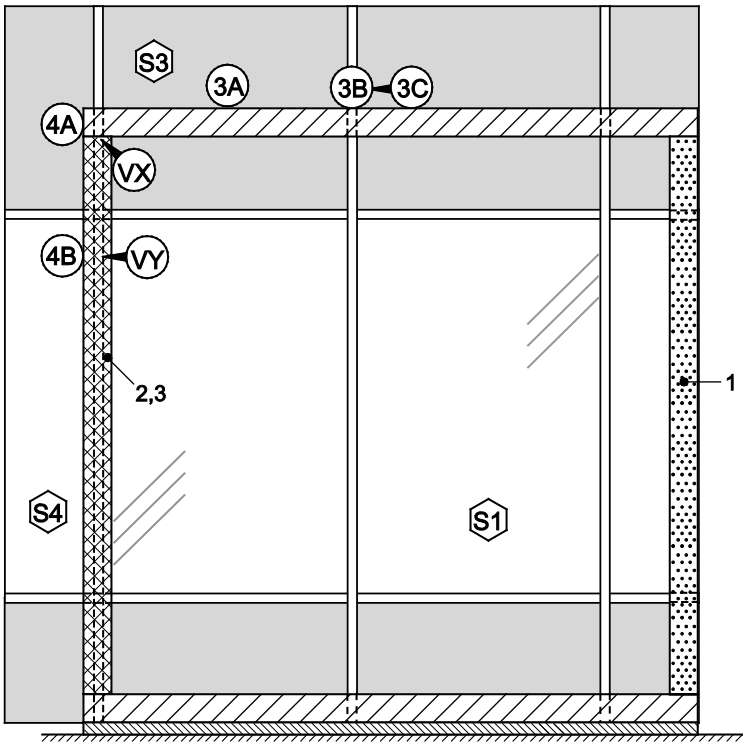
Figure 15 — Location of the thermocouples (maximum temperature rise) for external exposure – straight specimen, view from outside the furnace



Key

	furnace
	supporting floor (see 7.2)
1	associated wall
3A to 3C	thermocouples on Surface 3
4A, 4B	thermocouples on Surface 4
S1, S3, S4	surfaces 1, 3 and 4

Figure 16 — Location of the thermocouples (maximum temperature rise) for internal exposure – straight specimen, view from inside the furnace



Key

	furnace
	supporting floor (see 7.2)
1	associated wall
2	simulated wall
3	vertical linear gap seal
3A to 3C	thermocouples on Surface 3
4A, 4B	thermocouples on Surface 4
S1, S3, S4	surfaces 1, 3 and 4
VX, VY	thermocouples at the vertical linear gap seal

Figure 17 — Location of the thermocouples (maximum temperature rise) for internal exposure – straight specimen including a vertical linear gap seal, view from inside the furnace

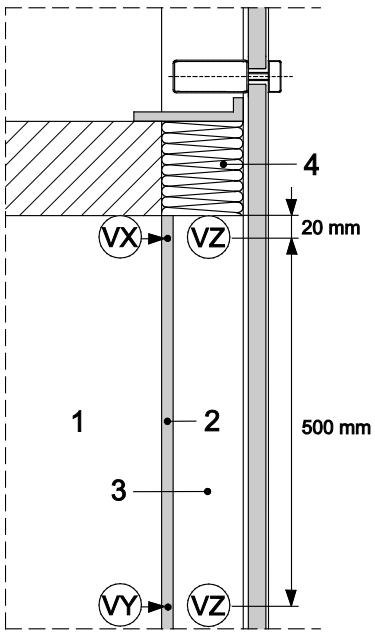
A **B**

Key

	supporting floor (see 7.2)
A	transom above (or below) the supporting floor and not in contact with the perimeter seal – no thermocouple HT required
B	transom in front of the supporting floor and/or in contact with the perimeter seal – thermocouple HT required
1	perimeter seal
HT	thermocouple on transom

Figure 18 — Location of thermocouple HT on a transom

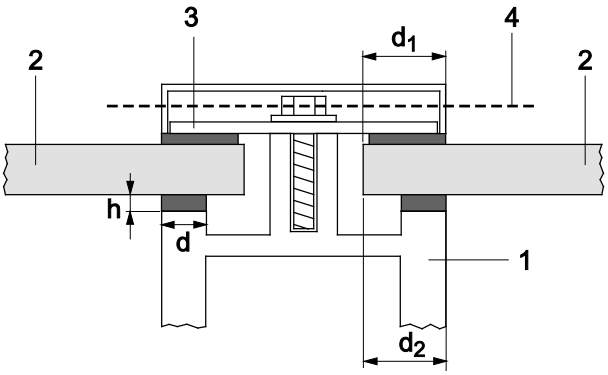
Dimensions in millimetres



Key

	supporting floor (see 7.2)
1	simulated wall
2	vertical linear gap seal
3	mullion
4	perimeter seal
VX, VY	thermocouples at the vertical linear gap seal

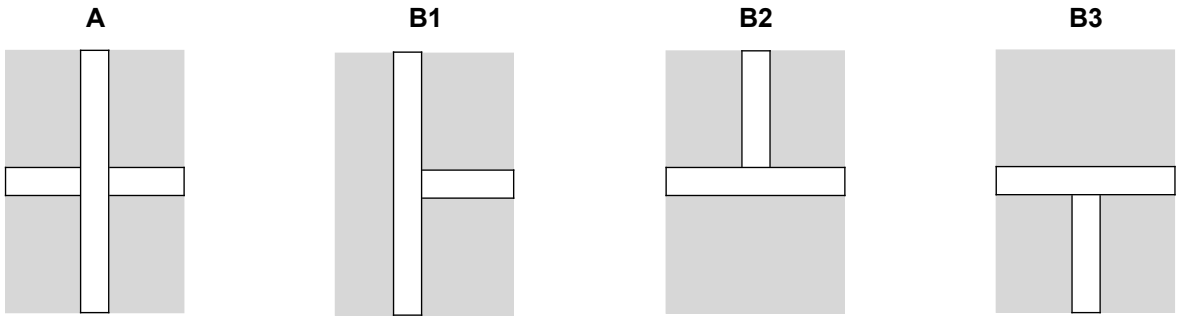
Figure 19 — Location of the thermocouples (maximum temperature rise) on a vertical linear gap seal



Key

1 mullion
2 infill panel
3 pressure plate
4 axis referred to in 13.3.7.2
d depth of the sealant / gasket
d1 outer edge cover / overlap of pressure plate
d2 inner edge cover
h height of the sealant / gasket

Figure 20 — Overlap of pressure plate

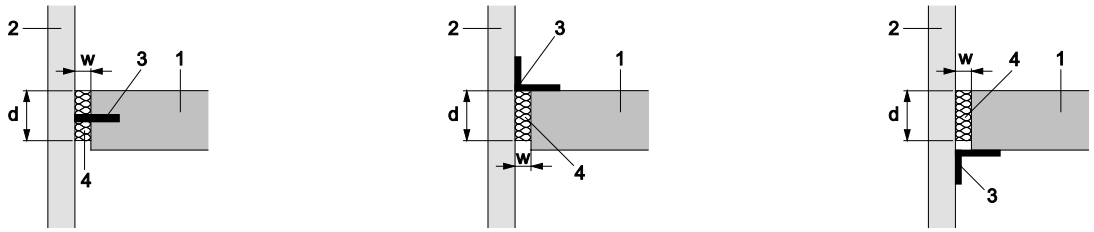


Key

A cross connection
B1 vertical T-connection
B2 horizontal / hanging T-connection
B3 horizontal / standing T-connection

Figure 21 — Connection between mullions and transoms

A **B** **C**

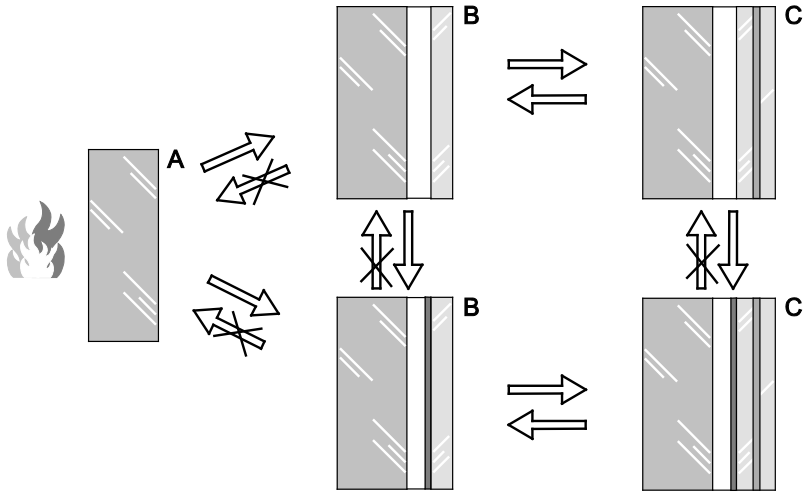


Key

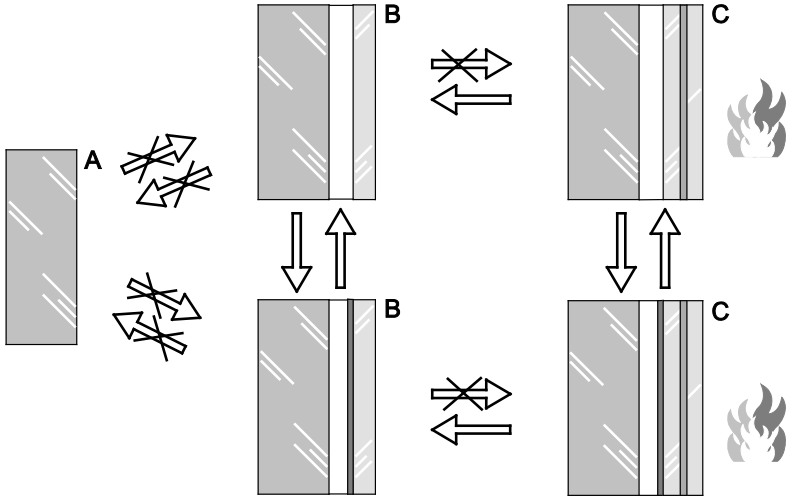
A	fixing in front of the floor slab
B	fixing on top of the floor slab
C	fixing on the underside of the floor slab
1	floor slab
2	curtain walling
3	fixing system
4	perimeter seal
d	depth of the perimeter seal
w	nominal width of the perimeter seal

Figure 22 — Types of fixing of the framing system (anchoring) and definition of width and depth of the perimeter seal

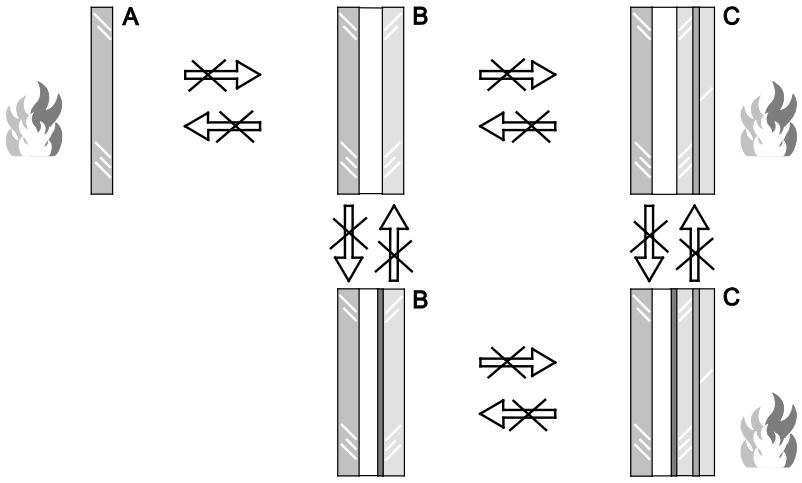
Fire resistant translucent or transparent infill panels for classification EI (i → o)



Fire resistant translucent or transparent infill panels for classification EI (o → i)



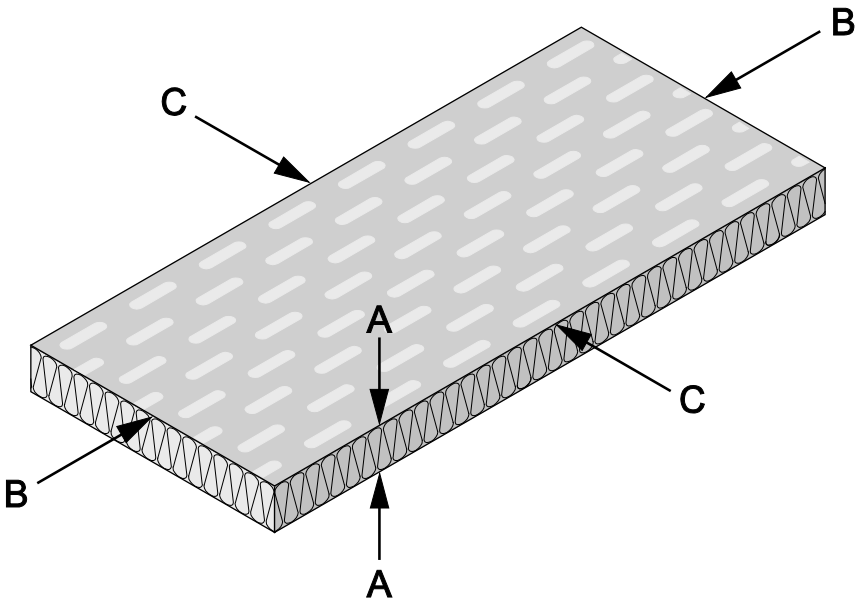
Fire resistant translucent or transparent infill panels for classification E, EW (o ↔ i, o → i or i → o)



Key

A, B, C type of fire resistant translucent or transparent infill panel

Figure 23 — Rules regarding types of fire resistant translucent or transparent infill panels



Key

A-A	through the slab thickness, as produced
B-B	along the slab length
C-C	across the slab width

Figure 24 — Mineral wool – compression directions

Annex A
(normative)

Field of direct application of test results for unitised construction

A.1 General

The rules given in A.2 to A.3 shall not be used for curtain walling constructions with glued infill panels (e.g. Structural Sealant Glazing Systems – SSGS).

A.2 Rules for the complete construction

A.2.1 Width of the curtain walling

The rules given in 13.2.1 apply.

A.2.2 Height of the curtain wall

The rules given in 13.2.2 apply.

A.2.3 Span length

The rules given in 13.2.3 apply.

A.3 Infill panels

A.3.1 Opaque (non-translucent/non-transparent) infill panels

The rules given in 13.4.1 apply.

A.3.2 Sandwich panels

The rules given in 13.4.2 apply.

A.3.3 Translucent or transparent infill panels

The rules given in 13.4.3 apply.

Annex B
(informative)

Explanatory notes

B.1 Notes to Clause 1 “Scope”

B.1.1 Test principles and requirements

The test procedure described in this European Standard is concerned with evaluating the fire resistance of a curtain walling, which differs in concept from other types of external walls, in that it is supported by the floor and located in front of the floor slab.

Figure B.1 details which Part of EN 1364 applies to which wall type.

The test evaluates the fire resistance for the following aspects of a curtain walling:

a) the curtain walling exposed either internally or externally;

b) any perimeter seal between the floor and curtain walling exposed from below;

c) any vertical linear gap seal between the curtain walling and a fire resistant internal wall if one is supplied as part of the system;

d) the temperature data from the fixing of the framing system exposed from below. These are collected for design purposes only and do not form part of the classification process.

Figure B.2 shows typical arrangements of curtain walling and indicates the relationship of the full configuration and part configuration relative to the entire structure.

The test specified in EN 1364-4 is used to examine:

e) the fire resistance of parts of a curtain walling using internal or external fire exposure;

f) the behaviour of the perimeter seal when heated from below.

B.1.2 Fire from the outside of the building (e.g. E, EW and EI (o → i))

Only Surface 1 is required to be assessed. The objective is to prevent a fire exposure on the outside of a building from penetrating the external envelope (curtain walling) of a building. The test construction may be installed inside the furnace so that results from tests according to EN 1364-1 may be used as test evidence. Care has to be taken that such results fulfil all requirements of this standard, e. g. the use of thermocouples H, I and J in glazed areas, as otherwise results may not be comparable.

B.2 Notes to Clause 3 “Terms and definitions”

As in curtain walling glass may be used for different purposes in different areas the term glass is not used but the specific term indicating the purpose of the component, e.g. infill panel, translucent or transparent infill panel.

B.3 Notes to Clause 5 “Test conditions”

Attention should be given to national requirements whether the external heating curve according to EN 1363-2 or the standard temperature time curve according to EN 1363-1 is satisfying the requirements.

B.4 Notes to Clause 6 “Test specimen”

Curtain walling will always be asymmetrical in an axis perpendicular to the surface but the orientation is fixed. This means that always the inner side will be exposed to internal fire exposure and the outer side to the external fire conditions.

Depending on the facet/corner angles intended to be used one or more options as described in Figure 8 may be used. Separate specimens may be used as shown in Figure 8A to D if the furnace is not big enough to accommodate the full configuration with all angles (8E and 8F).

The 50 mm clearance below the specimen are required to avoid restraint/support on the bottom of the specimen as otherwise the load of the specimen acting on the fixing of the framing system would not be simulated in the test.

In some cases an additional fixing of the mullions on top of the furnace/supporting floor may be necessary as the mullions are cut at this position as in practice and the part supporting the upper 500 mm panel may be not comparable stable as in practice due to the missing second fixing point.

B.5 Notes to 7.2.1 “Standard supporting floor”

The deflection of the floor in case of fire will have an influence on the fixing of the framing system (anchoring) of the curtain walling. A low density rigid floor (e.g. aerated concrete) is assumed to be more onerous than a high density rigid floor. To allow the test sponsor gain a wide range of floors covered by the test results the density of the standard supporting floor may be chosen by the test sponsor. Consultation of the test laboratory is recommended to avoid a premature failure of the floor. When using aerated concrete in the test a wider field of application can be achieved compared to using high density rigid floor by applying the rule given in 13.6. It is recommended to select the concrete coverage of the reinforcement as this will influence the deflection of the floor in the test.

A supporting floor is not necessary for tests with external fire exposure.

B.6 Notes to Clause 9 “Application of instrumentation”

B.6.1 Thermocouples

Plate thermometer: the distance of the plate thermometer to the specimen surface in concave corners has been chosen higher than in other areas as also in practice the corner would remain colder (Figure 10).

Thermocouples H to J have been added to be in line with changes done in the revised EN 1364-1.

The position of some thermocouples has been slightly moved to achieve unambiguous location definitions.

B.6.2 Deflection measurement

Test experience shows that in case of deflection measurement on the cover plates the measured values may not reflect the deflection of the mullion but only deflection of the cover plate which may be higher. Relevant for the field of application rules is the deflection of the frame members itself.

B.7 Notes to Clause 13 “Field of direct application of test results”

B.7.1 Overrun time

Table 2 defining the required overrun time for related field of application rules for translucent or transparent infill panels is in line with EN 15254-4 and the revised EN 1364-1.

B.7.2 Width of the curtain walling

In cases the curtain walling extends over fire separating elements a vertical linear gap seal abutting a simulated wall shall have been tested to cover a wider range of distance between separating walls compared to what has been tested. In addition the other end of the construction has to be constructed according to option A for Detail D1 according to Figure 7 to allow free deflection of the mullion. In case of option B the deflection may be restricted. In case option B of detail D1 has been used in the test only the width of the curtain walling and/or the distance between separating walls abutting the curtain walling as used in the test is covered.

B.7.3 Installation angle (vertical/sloped)

Different angles for E and EW classification compared to EI classification have been defined because of higher temperature inside the fixing area for curtain walling designed for E and EW classification than for curtain walling designed for EI classification due to different glass type used.

The restriction to framing systems made of Aluminium or steel has been made because framing made of timber could burn away so that infill panels could fall off.

B.7.4 Horizontally faceted curtain walling

For small facet angles (but larger than the angles defined as installation tolerance in 13.2.5.1) it is not possible to define a particular range of angles covered by the test results as this range will depend on the thickness of the infill panel and the construction details of the mullion profiles and pressure plate system. These details will determine the maximum distance the panel can be moved towards the centre of the mullion without compromising the minimum rebate necessary between infill panel and mullion screw channel to keep the overlap minimum the same as tested, see Figure B.3.

B.7.5 Height of the curtain walling / span length

Height of the curtain walling in the sense of repeating the height corresponding to the length of the mullions (including a fixed and a floating bearing) which is simulated in the test and covered by the test results shall not be mixed up with the span length which is defined as the distance between the fixed and floating bearing. Restrictions are necessary for the span length due to higher deflection in case of higher span length.

B.7.6 Framing system

B.7.6.1 Geometry/dimensions of mullions and transoms

The limits are based on following considerations: Timber has small deflection but burns away. Stainless steel has a higher thermal expansion coefficient than steel and hence limited extension. Aluminium shows considerable extension only in the beginning but rapidly starts softening whereas steel remains moving over the whole test period.

B.7.6.2 Framing material

Stainless steel covers steel because of higher deflection due to the higher thermal expansion coefficient of stainless steel compared to unalloyed or low alloyed steel.

B.7.6.3 Fixing of the framing system / Anchoring

To create the rules given in Table 5 a worst case philosophy has been used by considering temperature (below upper floor higher than on top of the lower floor), insulation of anchoring (fixing on top of floor or on the underside of the floor are normally not insulated, fixing in front of floor are normally insulated) and position of the fixed bearing which carries the load (on the upper floor = hanging curtain walling or on the lower floor = standing curtain walling) in relation to each other.

B.7.6.4 Pressure plate system

Some glass types for curtain walling of classification E and EW have a maximum allowable edge cover - otherwise the glass might break in the fire situation. Therefore, increase in the overlap of the pressure plate is restricted to curtain walling with classification EI.

B.7.7 Infill panels / spandrel panels

B.7.7.1 Area of individual rectangular fire resistant translucent or transparent infill panels

For curtain walling with an EW classification the width/height/area rules are only applicable if it is evident that the requirements for radiation are fulfilled in every case. This can be assumed to be the case if the test results are within the given restrictions. The value of 12,5 kW/m^2 is based on the requirement that the test specimen was glazed over the size of 3 × 3 m. The reason is that a radiometer as described in EN 1363-2 is not designed to measure the radiation from translucent or transparent infill panels within a curtain walling containing non-translucent/non-transparent spandrel panels in addition. For such a situation extended field of application rules apply.

B.7.7.2 Exchange of glazing materials

With expanding glass the gasket is not really relevant.

B.7.8 Perimeter seal

B.7.8.1 Material

In case variations of mineral wool are used in one test specimen according to 6.3.5 the specimen shows two types of splices: a splice within the same material and a splice between material A and B. Only the splices within the same material will normally be relevant for installation in practice.

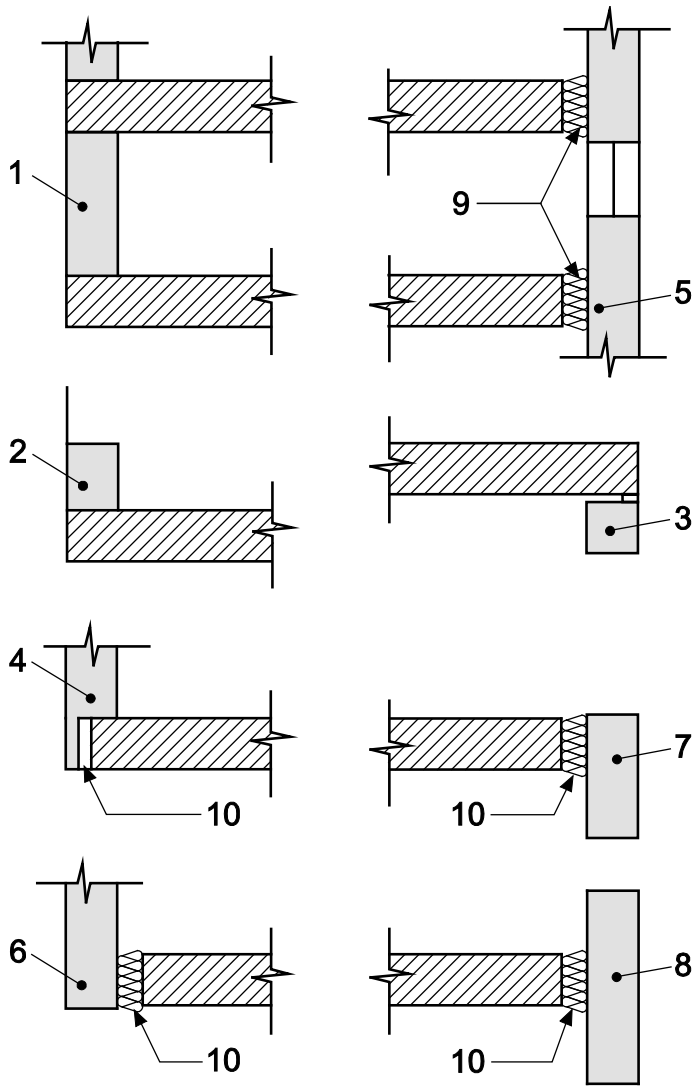
Mineral wool: as no European test standards are available for parameters relevant for the fire resistance behaviour (e.g. short-term temperature resistance, “melting point”) no direct field of applications rules regarding exchange of material can be defined except for the density of the same material as used in the test.

B.7.8.2 Covering

Thermoplastic materials may decompose and produce flammable gases that lead to sustained flaming in the spandrel area.

B.7.8.3 Movement capability

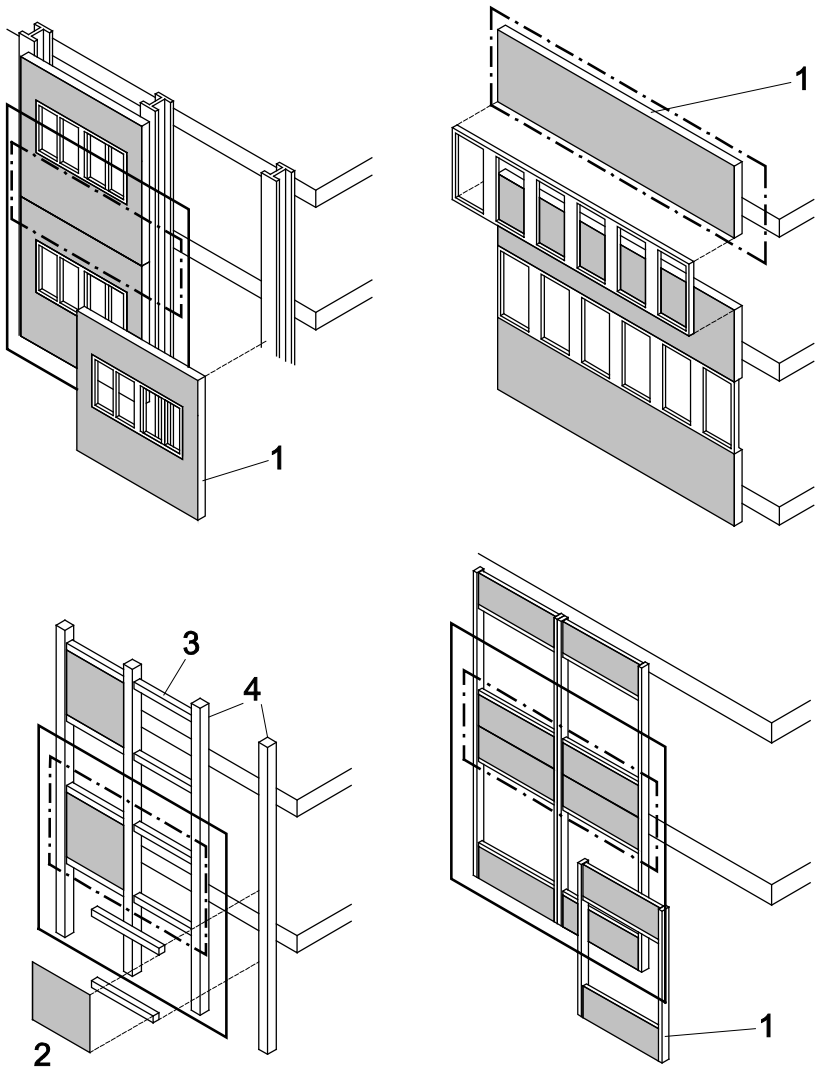
Rules regarding test requirements in case movement capability for the perimeter seal is required are given in ETAG 026-3.



Key

Item	Type of external wall	Component	Standard
1	external wall between floors	complete wall (full scale)	EN 1364–1
2	external wall between floors	spandrel, placed completely on the floor	EN 1364–1
3	external wall between floors	spandrel (downstand), hung up below the floor	EN 1364–1
4	external wall partially between floors	spandrel (upstand), placed partly on the floor	EN 1364–4
5	curtain walling Type B	complete wall (full scale)	EN 1364–3
6	curtain walling Type A or B	spandrel (upstand) placed in front of the floor	EN 1364–4
7	curtain walling Type A or B	spandrel (downstand) placed in front of the floor	EN 1364–4
8	curtain walling Type A or B	spandrel (combination of items 6 and 7)	EN 1364–4
9	curtain walling Type B	perimeter seal	EN 1364–3 or −4
10	curtain walling Type A or B	perimeter seal	EN 1364–4

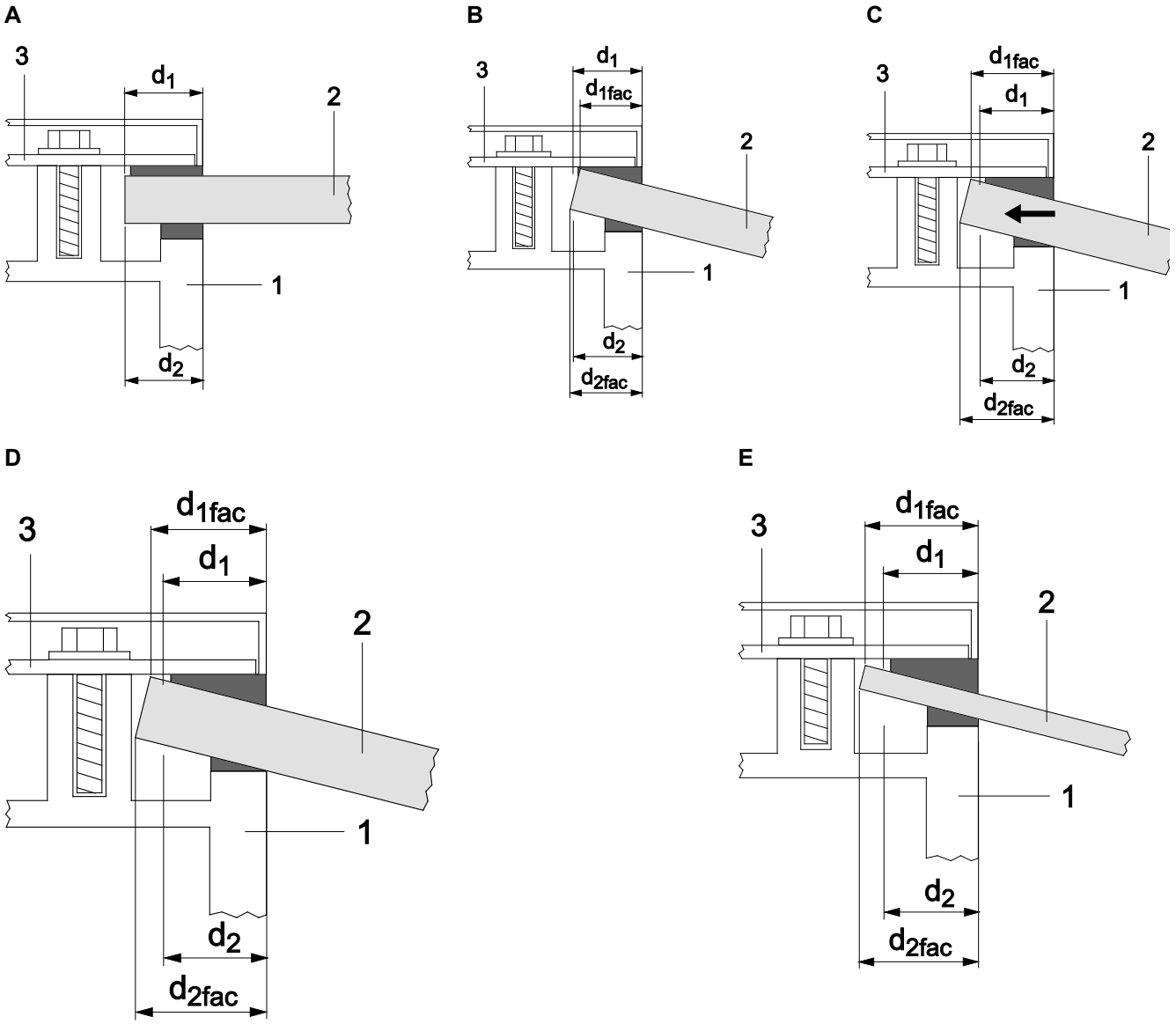
Figure B.1 — Appropriate test method depending on the type of external wall/curtain walling (component)



Key

▭	full configuration test specimen (EN 1364–3)
▭	part configuration test specimen (EN 1364–4)
1	pre-fabricated elements of the curtain walling
2	infill panel
3	transom
4	mullion

Figure B.2 — Appropriate test method for different wall configurations



Key

A	straight curtain walling
B	faceted curtain walling, d1fac ≥ d1 not fulfilled
C	faceted curtain walling, d1fac ≥ d1 fulfilled as infill panel moved toward the centre of the mullion
D, E	illustration of the influence of panel thickness on the edge cover
1	mullion
2	infill panel
3	pressure plate
d1	outer edge cover / overlap of pressure plate in straight condition
d1fac	outer edge cover / overlap of pressure plate in faceted condition
d2	inner edge cover in straight condition
d2fac	inner edge cover in faceted condition

Figure B.3 - Relation of edge cover and facet angle of horizontally faceted curtain walling

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[1] EN 1279-1, *Glass in Building - Insulating glass units - Part 1: Generalities, dimensional tolerances and rules for the system description*

[2] EN 1364-1, *Fire resistance tests for non-loadbearing elements - Part 1: Walls*

[3] EN 1364-4, *Fire resistance tests for non-loadbearing elements - Part 4: Curtain walling - Part configuration*

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