



ASFP Technical Guidance Document 19

Fire Resistance Test for 'Open-State' Cavity Barriers used in the external envelope or fabric of buildings

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Foreword

Following the publication of BS EN 1364-6, it is the intention of the ASFP to withdraw Technical Guidance Document 19 on 2nd September 2029. This transition period is to allow testing laboratories and industry time to adopt the new BS EN standard and will be reviewed on a regular basis.

This test method was originally drafted by a sub-group of ASFP Task Group 3 (Firestopping) which in turn reports to the ASFP Technical Committee. It was drafted in response to a need identified by the ASFP for a test method to evaluate the fire resistance of 'open state' cavity barriers. The method is also intended to assist certification bodies to develop technical schedules allowing for the third-party product certification of 'open state' cavity barriers.

This test method is only intended to evaluate the fire resistance performance of the open-state cavity barrier against fire exposure from below, in terms of the time from ignition necessary to effectively seal the cavity, and to maintain that seal. This test assembly does not include a façade system and the results alone do not represent what might happen in a façade system.

To evaluate the performance of open state cavity barriers within a specific facade system, a large-scale test, such as BS 8414 'Fire performance of external cladding systems' should be considered.

Introduction

The purpose of this test is to measure the ability of a representative specimen of an 'open state' cavity barrier to resist the upward spread of fire. This can be of particular concern in the case where fire spread from one part of a building to another is often via the cavity between the rear of the external envelope and the backing wall. Such fire spread is usually upwards and if aided by a 'chimney effect' can be rapid if not restricted by effective cavity barriers.

In the test a representative sample of an 'open state' cavity barrier is exposed to a specified regime of heating and pressure as specified in EN 1363-1. The fire resistance performance of the test specimen is also monitored as stipulated by this standard and the results are expressed as the time for which the appropriate criteria have been satisfied.

Caution

The attention of all people 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 operation hazards may also arise during the construction of the test elements or structures, their testing and disposal of test residues.

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

1 Scope

This test method specifies a procedure for determining the fire resistance of 'open state' cavity barriers when subjected to the standard fire exposure conditions and performance criteria stipulated in EN 1363- 1.

This method is applicable to non-loadbearing, horizontally oriented 'open state' cavity barriers, which are used to provide fire separation within cavity voids such as those located between an external envelope and the face of a building or between the timber skin and outer brick leaf of a timber framed building. These cavity barriers are specifically designed to provide a separating function only. They may be insulating or non-insulating.

2 Normative references

This test method incorporates by dated or undated reference, provisions from other publications. These references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1363-1, Fire resistance tests — Part 1: General requirements

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

EN 1364-1, Fire resistance tests for non-loadbearing elements – Part 1: Walls EN

ISO 13943, Fire safety — Vocabulary

3 Definitions

For the purpose of this standard the definitions given in EN 1363-1 and EN ISO 13943, together with the following, apply:

3.1 Concealed space (Cavity)

A space in a building where fire may develop or pass through that is not normally used or accessible by humans

3.2 Cavity barrier

A non-loadbearing vertically or horizontally oriented element designed to provide fire separation in a concealed space (cavity).

3.3 ‘Open state’ cavity barrier

Cavity barriers that allow ventilation and drainage in the cold state, but which either close in a fire, or are inherently fire resisting providing fire separation in the cavity.

3.4 Air gap

The space between the back surface of the external wall panels and the outer face of the inner wall or insulation layer.

3.5 Splice

A connection or junction between adjacent lengths (or part lengths if cut) of a cavity barrier.

4 Test equipment

In addition to the test equipment specified in EN 1363-1, and if applicable EN 1363-2, the internal dimensions of the test furnace shall be such that a distance of at least 200 mm exists between the long edge of a ‘open state’ cavity barrier and the wall of the furnace, subject to a minimum internal size of 1m × 1m × 1m.

5 Test conditions

5.1 Heating conditions

The heating conditions and the furnace atmosphere shall conform to those given in EN 1363-1 and if applicable EN 1363-2.

5.2 Pressure conditions

The furnace pressure shall be monitored and controlled so that 5 minutes after the commencement of the test, the furnace pressure shall be $20 \pm 5\text{Pa}$ at a position $100 \pm 10\text{mm}$ below the bottom face of the open-state cavity barrier. 10 minutes after the commencement of the test, the furnace pressure shall be $20 \pm 3\text{Pa}$ at a position $100 \pm 10\text{mm}$ below the bottom face of the open-state cavity barrier.

Note: laboratories should aim to achieve the specified pressures as soon as possible after commencement of the test. Furnaces should not be run under e.g. negative pressure for the first few minutes and then the pressure only established just before 5 minutes.

6 Test specimen

6.1 General

The test specimen consists of an 'open state' cavity barrier. One test specimen shall be prepared for each type of test construction which needs evaluation.

6.2 Size

The open-state cavity barrier shall be of uniform design cross-sectional area with a minimum length of 900mm.

In order to avoid boundary effects, the distance between the long edge of the 'open state' cavity barrier and the outer perimeter of the heated part of the separating element shall be not less than 200mm at any point.

6.3 Number of test specimens

One test specimen representing each type of element shall be tested from the underside.

6.4 Design

6.4.1. General

The test specimen shall be fully representative of the construction used in practice as far as is practicable. More than one type of 'open state' cavity barrier system may be included in a single test construction provided the requirements on space separation and thermal and pressure conditions are met.

Each test specimen shall incorporate at least one joint or splice as recommended by the test sponsor as typical for the purposes of erection, construction or expansion. Different jointing systems or splices may be included in a single test specimen provided that they are all subjected to furnace temperature and pressure conditions equal to, or greater than those specified in 5.2.

The design features which influence fire performance should be included to give the widest application can be derived from the field of direct application.

If the 'open state' cavity fire stop requires any mechanical fixing, the maximum fixing centres should be tested as recommended by the manufacturer. This may result in a longer seal than the minimum 900mm length stated in 6.2 which in turn would dictate a test in a larger furnace.

The gap between the elements shall be sealed at each end.

6.4.2 Test configuration

Several examples of test configurations are given below. Other test configurations may also be considered provided they satisfy the temperature and pressure conditions given in 5.1 and 5.2.

6.4.2.1. General test set up cross section (Block to non-combustible material)

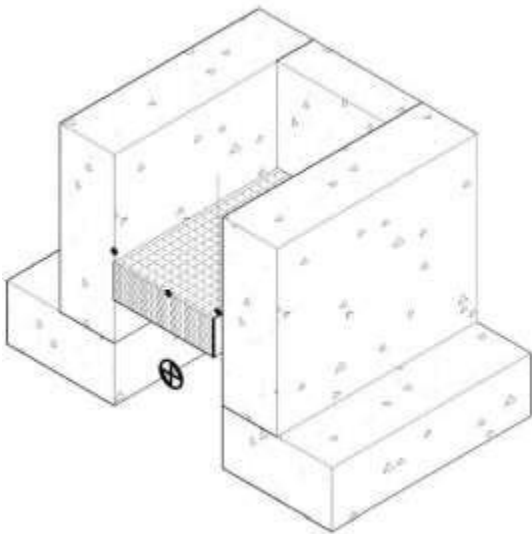


FIG 1a

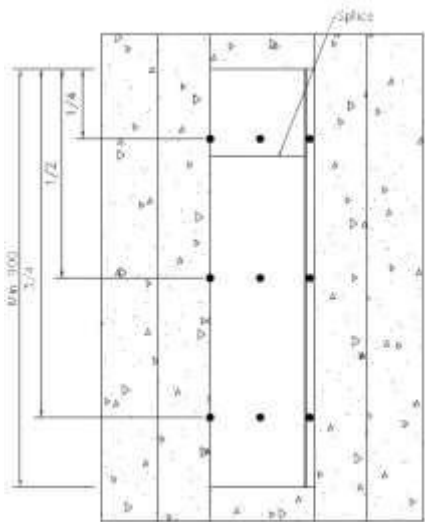


FIG 1b

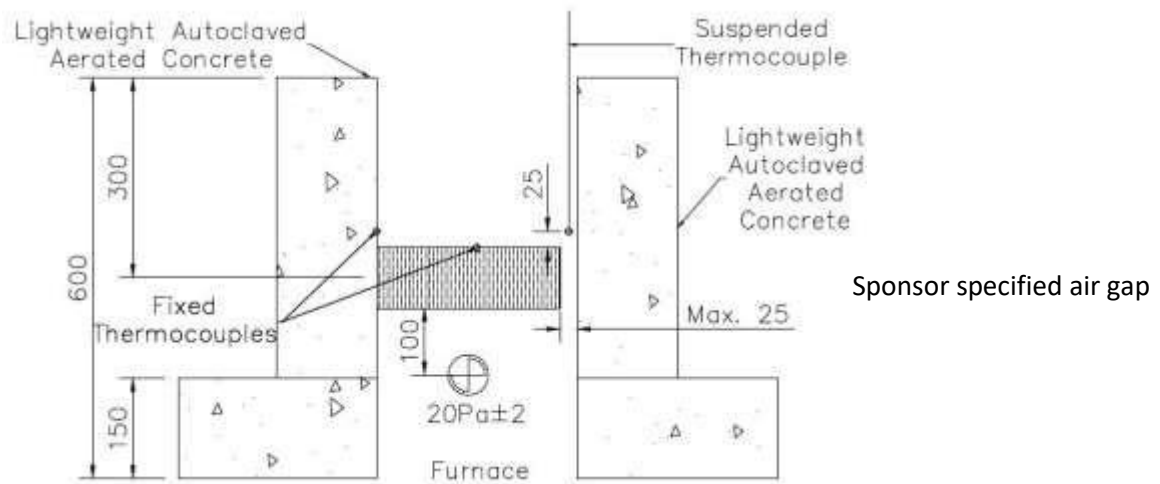


FIG 1c

6.4.2.2. General test set up cross section (Timber frame to non-combustible material)

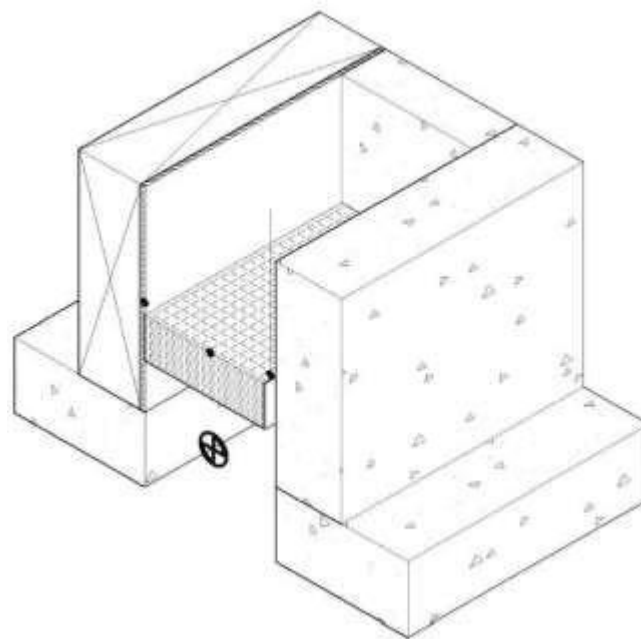


FIG 2a

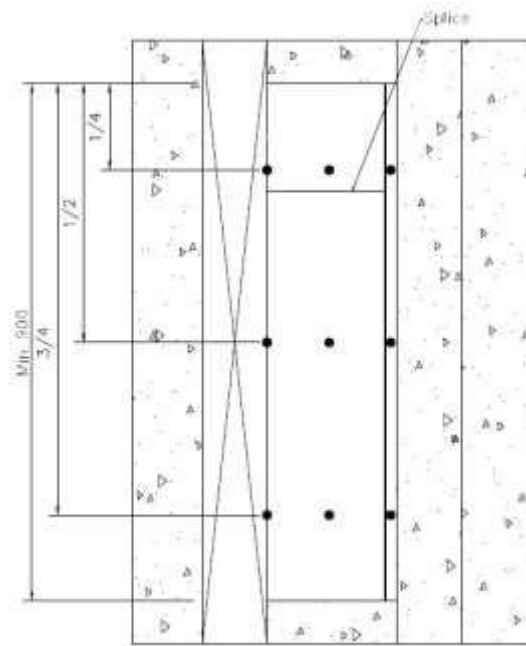


FIG 2b

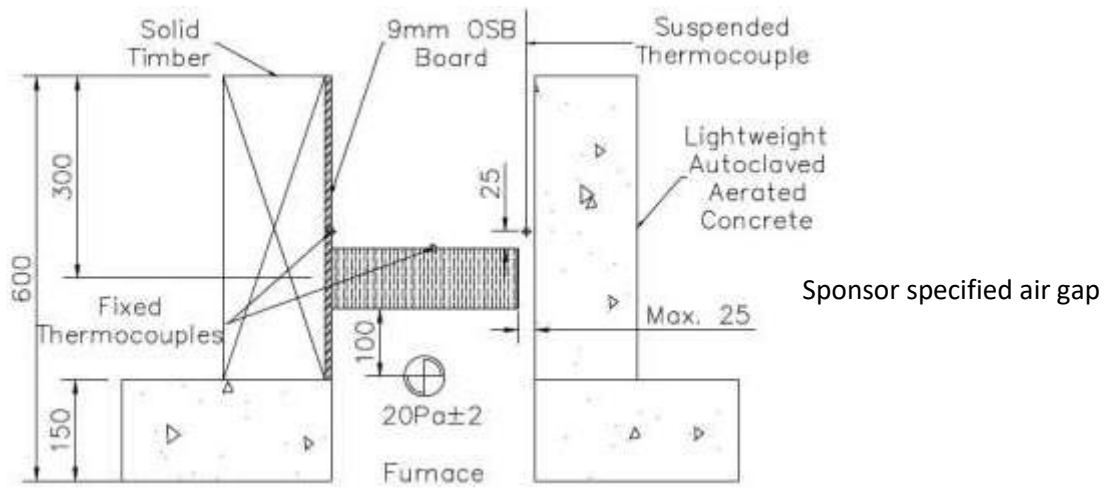


FIG 2c

6.4.2.3. General test set up cross section (Block with interrupted insulation to non- combustible material)

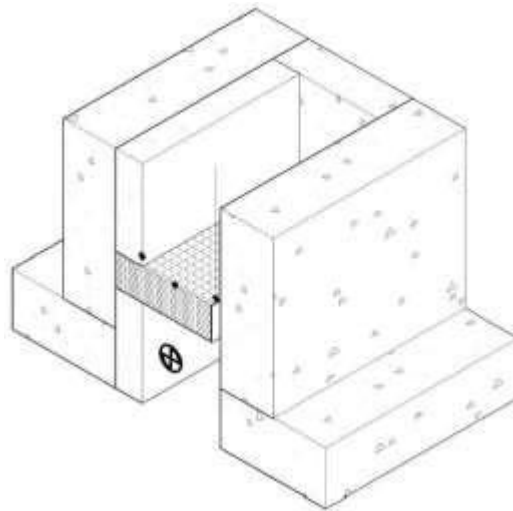


FIG 3a

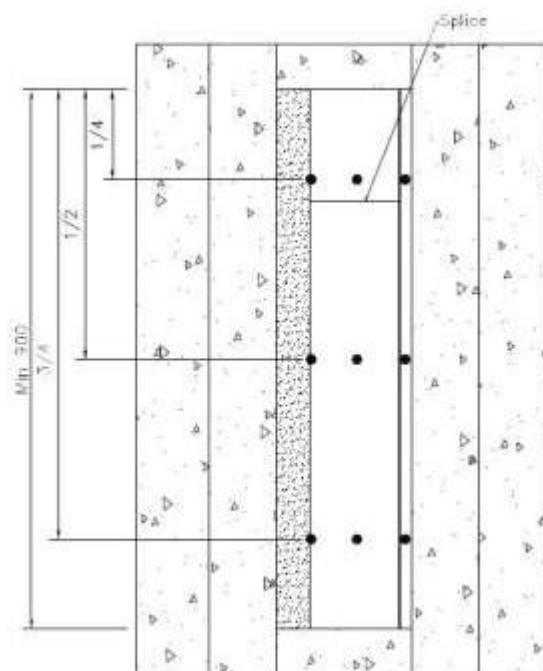


FIG 3b

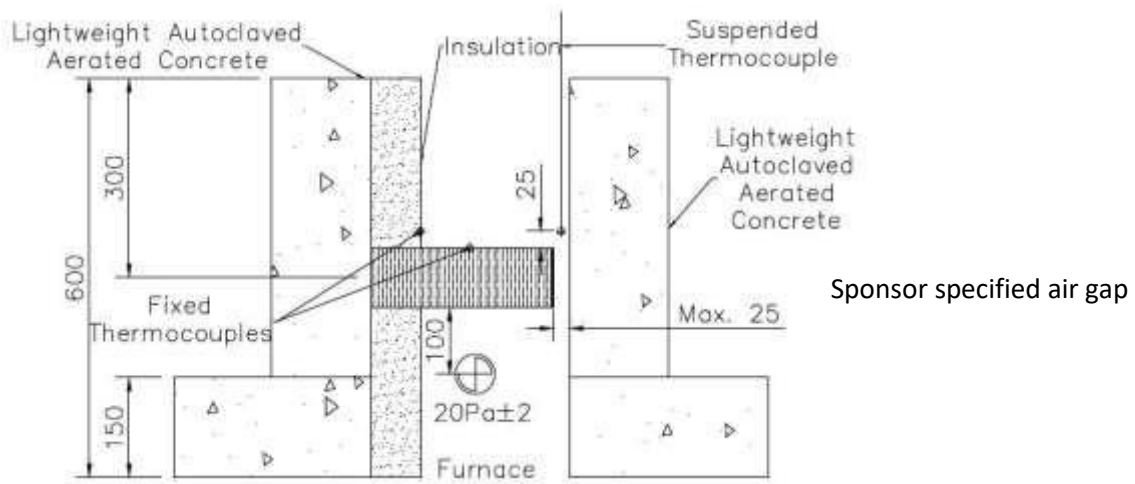


FIG 3c

6.4.2.4. General test set up cross section (Block with uninterrupted insulation to non- combustible material)

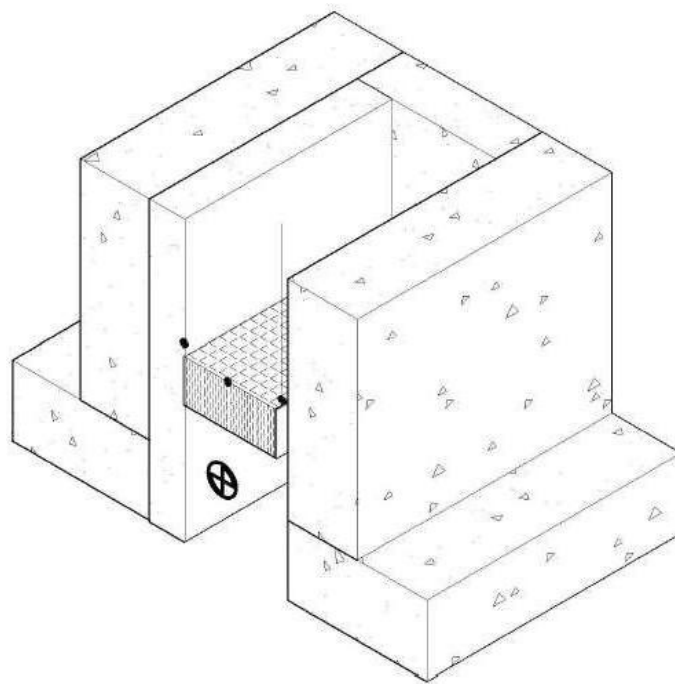


FIG 4a

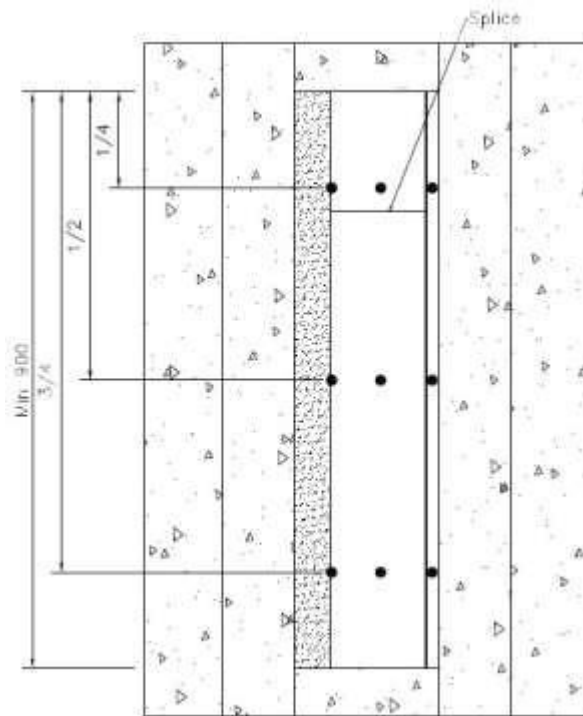


FIG 4b

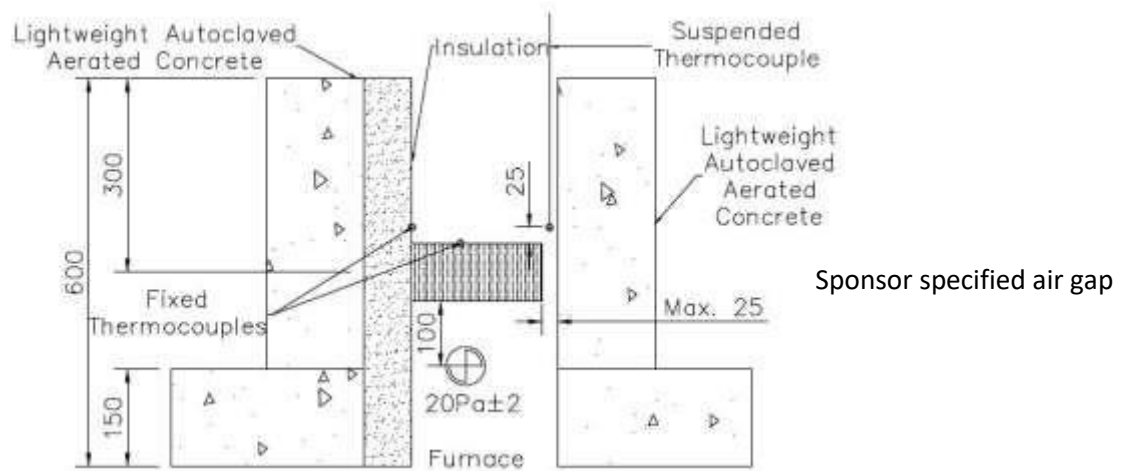


FIG 4c

6.5 Construction

The test specimen shall be constructed as described in EN 1363-1.

6.6 Verification

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

7 Installation of test specimen

7.1 General

All materials used in the construction, fabrication and installation process of the test specimen shall be representative of the design, materials and workmanship of those to be used in practice.

Where voids exist within an 'open state' cavity barrier (e.g. when it is in the form of a tube), the ends shall be hermetically sealed in order to prevent airflow through the test specimen.

If the test specimen is mounted in a supporting construction not given in EN 1363-1 or described in 7.2.2, then the result will only be valid for cavity barriers mounted in the construction as tested.

7.2 Supporting construction

7.2.1. General

The supporting construction shall be of known fire resistance and representative of that used in practice. The supporting construction may be either one of the standard constructions listed in 7.2.2 or a specific construction. In the latter case, however, the field of direct application is limited (see 13.2).

7.2.2. Standard supporting construction

7.2.2.1. Concrete and masonry elements

a) Wall constructions

Density: (650 ± 200) kg/m³ Material: Autoclaved aerated concrete or $(2\ 400 \pm 200)$ kg/m³ Material: Normal density concrete

b) Floor constructions

Density: (650 ± 200) kg/m³ Material: Autoclaved aerated concrete or $(2\ 400 \pm 200)$ kg/m³ Material: Normal density concrete

7.2.2.2. Timber elements

Timber used for test constructions shall have a nominal density of (500 ± 50) kg/m³ as measured at 12 % moisture content.

7.2.2.3. Metallic elements

Any metallic joint face may be simulated by the following test construction. The face of a concrete supporting construction is covered by 10 mm stone mineral fibre insulation of a density of at least 35 kg/m³ and by an 8 mm thick steel angle. The side of the test construction where the steel angle is visible shall be at the non-exposed side of the test construction.

7.3 Splice locations

Where splices (see 3.7) or consecutive lengths of pre-formed components require to be jointed in practice, a typical joint shall be included. If two methods of joining consecutive lengths of component(s) are to be incorporated in the same specimen of 'open state' cavity barrier, then each method shall be separated by at least 200mm. All fixing methods, including e.g. brackets, each side of a splice shall be included where possible.

8 Conditioning

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

9 Application of instrumentation

9.1 General

The control, monitoring and recording equipment shall be in accordance with EN 1363-1.

9.2 Thermocouples

9.2.1. Furnace thermocouples (plate thermometers)

Plate thermometers shall be provided in accordance with EN 1363-1. The plate thermometer shall be located in a plane 100 mm below the exposed face of the test construction with side 'A' of the plate thermocouple facing the floor of the furnace.

At least one thermometer shall be provided for every 1.5 m² of the heated area of the test construction, subject to a minimum number of four thermometers for each test construction.

Plate thermometers shall be symmetrically distributed with respect to the heated area of the test construction, but not in a position where they can shield the exposed face of the test specimen to the effects of the radiant furnace heat.

9.2.2. Unexposed surface thermocouples

9.2.2.1. General

Surface thermocouples of the type prescribed in EN 1363-1 shall be attached to the unexposed surface of the test specimen to measure the average and maximum temperature rise. Figures 1 to 5 in clauses 6.4.4.1 to 6.4.4.5 show examples of the locations of thermocouples.

In the case of non-planar surfaces, the disc and the pad shall be deformed to follow the surface profile. In the case of small sections it is permissible to reduce the size of the pad to a minimum dimension of 12mm.

If a potential weak point can be identified, additional fixed thermocouples shall be attached to this point, e.g. adjacent to a splice.

Thermocouples may be attached to parts of barriers that are not expected to move during the test. such as a mineral wool component but they should not be attached to parts that are expected to move e.g. any intumescent component.

Where it is impractical to attach thermocouples because of the nature of the surface of the 'open state' cavity barrier, careful use may be made of the roving thermocouple provided that no mechanical damage or restriction of movement is caused to the test specimen.

9.2.2.2. Air temperature

Measure the temperature using an unexposed face thermocouple (but without the insulating pad) at the locations shown in figures 1 to 2.

9.2.2.3. Roving thermocouple

The information obtained on unexposed face surface temperatures shall be supplemented by additional data derived from measurements obtained using a roving thermocouple applied to identify and monitor any local "hot spots" in accordance with EN 1363-1. If it is determined that the roving thermocouple may damage the test specimen, it shall not be used and the reason noted in the test report.

Note: the roving thermocouple shall not be used before the cavity barrier has closed as defined in 11.11.

9.3 Integrity measurement

The integrity of the specimen shall be assessed as described in EN 1363-1.

10 Test procedure

10.1 General

The test shall be carried out using the equipment and procedure specified in EN 1363-1.

10.2 Furnace control

Measure and control furnace temperature and pressure in accordance with EN 1363-1 and the pressure requirements in clause 5.2.

10.3 Measurement of criteria

Evaluation of the test specimen shall conform to the insulation and integrity criteria in EN 1363-1.

For the evaluation of integrity, the use of gap gauges is prohibited.

10.4 Observations during the test

Monitor the test specimen and record observations of the behaviour in accordance with EN 1363-1.

Monitor and record the time taken for the cavity barrier to close by visual observation and by use of the 'suspended' thermocouple. Closure is deemed to have occurred when there is no visible gap and the 'suspended' thermocouple temperature is less than 180 K rise above initial ambient temperature.

Monitor and record any sustained flaming which may occur on the unexposed surfaces of the test construction, including any timber and insulation products above the 'open-state' cavity barrier test specimen.

10.5 Termination of test

Terminate the test for one or more of the reasons given in EN 1363-1.

11 Performance criteria

11.1 Effective Closure of the 'open state' cavity barrier

The time taken for the cavity barrier to close, as defined in clause 10.4 shall be measured and recorded.

Cavity barriers must close within 5 minutes from the start of the test as determined above or they will have been deemed to have failed the test.

11.2 Insulation

Transmission of heat through the test construction shall not raise any one of the thermocouple temperatures of the unexposed surface of the test specimen more than 180 K above its initial temperature. However, any failure before 5 minutes shall be disregarded.

Note: the 'suspended' thermocouple may exceed 180 K rise in advance of the effective closure of the 'open-state' cavity barrier test specimen. This shall also be disregarded.

Note: the exclusion of any failure of insulation before 5 minutes results from the time required to establish the specified temperature and pressure conditions. A similar approach is included in the fire resisting damper standard EN 1366-2.

11.3 Integrity

Integrity shall be determined in accordance with EN 1363-1 except that any failure before 5 minutes shall be disregarded unless any area of any surfaces exhibits sustained flaming above the seal within that period.

Note: the exclusion of any failure of integrity before 5 minutes results from the time required to establish the specified temperature and pressure conditions. An identical approach is included in the fire resisting damper standard EN 1366-2.

11.4 Expression of results

The result shall be stated in terms of elapsed time to the nearest completed minute of test between the commencement of the test and the time at which:

- The cavity barrier effectively closes, as defined in 11.1 above.
- The insulation criteria are no longer complied with in accordance with EN 1363-1 subject to the relaxation for the roving and 'suspended' thermocouples given in 9.2.2.2 and 11.2.

Note: The value of 'insulation' as defined in EN 1363-1 can only be determined from thermocouples fixed to the unexposed surface of the specimen or the roving thermocouple. If there are no fixed thermocouples then this shall be stated. The values recorded by the suspended and fixed thermocouples shall be tabulated separately as shown in clause 12.

- The 'air gap' insulation determined from the suspended thermocouples shall also be recorded but not used in the evaluation of insulation as defined in EN 1363-1.
- The integrity criteria are no longer complied with in accordance with EN 1363-1 and 11.3 above.

12 Test report

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

- a) a full description of the splicing method(s) used.
- b) A table of results in the following format

Specimen	Integrity (minutes)		Insulation (mins) (fixed thermocouples)	'Air gap' Insulation (mins) (Suspended thermocouples)
	Cotton Pad	Sustained Flaming		
Example	131	145	45	71

- c) The following statement next to the table of results: ““Due to the nature of ventilated/open state cavity barrier seals, an initial spike in temperature is recorded by the thermocouples positioned in the air gap adjacent to the seal as it is open to the furnace. The temperature is rapidly reduced once the seals react and fill the whole cavity. The ‘air gap insulation’ figure quoted in the results disregards this initial spike in temperature provided the temperature returns to below 180°C rise within the first five minutes of the test.”

13 Direct field of application of the test results

13.1. General

The results of the fire test are directly applicable to similar constructions where one or more of the changes listed below are made:

- a) Increase in the length of the cavity barrier provided that a minimum of 900mm is tested
- b) Decrease in distance of fixing centres
- c) Void size can be interpolated between minimum and maximum voids tested
- d) If a single void size is tested, the result is only applicable to that void size
- e) A decrease in the gap between the seal and any external envelope subject to any minimum requirements for ventilation purposes e.g. CWCT requirement for not less than 25mm, NHBC requirements etc. Note: applying this rule shall not result in the surface of any combustible insulation being closer to the edge of the seal (air gap) than tested.

13.2. Substrates

Testing using a combustible substrate covers a limited combustible or non-combustible substrate

13.3. Insulation

- 1. Test on insulation running behind the cavity will cover interrupted insulation
- 2. For **continuous** insulation the following insulation hierarchy is used:
Best – stone wool, phenolic, PIR, glass wool, PUR, EPS – Worst
- 3. For **interrupted** insulation the following insulation hierarchy is used:
Best – stone wool, glass wool, phenolic, PIR, PUR, EPS – Worst

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