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Fire resistance tests for non-loadbearing elements - Part 6: Cavity Barriers

Feuerwiderstandsprüfungen für nichttragende Bauteile - Teil 6: Hohlraum-Brandsperren

Essais de résistance au feu des éléments non porteurs - Partie 6 : Dispositifs de recoupement de lame d'air

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13.220.50	Požarna odpornost gradbenih materialov in elementov	Fire-resistance of building materials and elements
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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Page

European foreword

This document (prEN 1364-6:2016) has been prepared by Technical Committee CEN/TC 127 “Fire safety in buildings”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

CEN TC 127 is the CEN committee for drafting fire test standards in support of the Construction Products Regulation. The test method is needed in support of ETAG 026-5 for cavity barriers.

Introduction

Cavity barriers are provided within buildings to restrict the spread of smoke and fire in concealed spaces. Cavity barriers may be 'closed' e.g. in roof voids, under raised floors, between the inner and outer leaves of walls such as in timber framed construction; or they may be 'open', for example as used in ventilated facade systems, roof eaves, and rain screen cladding systems.

The purpose of this test is to measure the ability of a representative specimen of a cavity barrier to resist the spread of fire from one side to another. A representative sample of a cavity barrier is exposed to a specified regime of heating and pressure. The performance of the test specimen is monitored on the basis of criteria in EN 1363-1. The fire resistance of the tested construction is expressed as the time for which the appropriate criteria have been satisfied.

The principles embodied in this method follow those embodied in EOTA TR31, the fire resistance test for closed cavity barriers published in 2008. However, TR31 is not applicable to open cavity barriers and consequently this method has had to be adapted to include these.

Reference Scenario and limitations

Closed cavity barriers – whose function is to close a gap between fire resistant elements of building structure – fall within the scope of the small room fire scenario where ISO 834-1 has been recognized as the reference fire resistance test.

For open cavity barriers, for example those used in ventilated facades, rain screens and roof eaves, a European reference scenario has not yet been established. Work is on-going to develop a full-scale façade test and it is expected that this method will be correlated to that full scale test. Consequently, for the time being, results of tests to this standard cannot be used to imply performance of an external facade system in which the open cavity barrier is included. The test results may be used as supplementary evidence of cavity barrier performance in systems already accepted by current national regulations. Further information is given in Annex E.

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 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 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 test method specifies a method for determining the fire resistance of cavity barriers and is to be used in conjunction with EN 1363-1.

This standard is applicable to non-loadbearing vertically or horizontally oriented closed and open cavity barriers, which are used to provide fire separation to uncompartmented or ventilated spaces. Cavity barriers are designed to provide fire separating performance and the test method is therefore based on the standard room fire exposure in EN 1363-1. Open cavity barrier specimens are installed for test in one of two ways to simulate slow or sudden exposure in use.

This standard is not applicable to cavity barriers containing penetration seals, which are to be tested in accordance with EN 1366-3.

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 1366-3, *Fire resistance tests for service installations - Part 3: Penetration seals*

EN ISO 13943:2010, *Fire safety - Vocabulary (ISO 13943:2008)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1363-1 and EN ISO 13943:2010 and the following apply.

3.1
concealed space
space in a building where fire could develop or pass through that is not normally used or accessible by humans

3.2
closed cavity barrier
non-loadbearing vertically or horizontally oriented element designed to provide fire separation in a concealed space (cavity)

3.3
splice
connection or junction between or within the length of a linear gap seal where it is being used as a cavity barrier

3.4
'open' cavity barrier
non-loadbearing vertically or horizontally oriented element designed to provide fire separation in a concealed space (cavity)

Note 1 to entry: These are open to 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.

3.5
façade system
system used to protect the outside vertical envelope of a building from the elements

3.6
air gap
space between the back surface of the external wall panels and the outer face of the inner wall or insulation layer

4 Test equipment — Additional requirements for open cavity barriers

In addition to the test equipment specified in EN 1363-1, it is required that for open cavity barriers the internal dimensions of the test furnace shall be such that a distance of at least 200 mm exists between the long edge of the open cavity barrier and the wall of the furnace.

The size of the furnace required will depend on the nominal width of the open cavity barrier and is given in Table 1 (see also 6.2).

Table 1 — Open cavity barriers

Nominal width of open cavity barrier	Minimum size of furnace required
< 100 mm	1 m x 1 m x > 0,75 m deep
> 100 mm up to 300 mm	10 times nominal width of cavity barrier x > 0,75 m deep
> 300 mm	3 m x 3 m x > 0,75 m deep

5 Test conditions

5.1 Heating conditions

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

For open cavity barriers, an option is provided for the use of a removable shield underneath the cavity barrier which is removed at 5 min into the test immediately exposing the cavity barrier to the furnace heating conditions at that time. See Annex E.

5.2 Pressure conditions

5.2.1 General

The pressure conditions and the furnace atmosphere shall conform to those given in EN 1363-1 unless modified as follows:

5.2.2 Cavity Barriers mounted within leaves of walls or in roof voids

For cavity barriers mounted between the leaves of walls and above suspended ceilings/in loft spaces, the pressure conditions and the furnace atmosphere shall conform to those given in EN 1363-1.

5.2.3 Cavity barriers mounted underneath raised access floors

For cavity barriers mounted underneath raised access floors, the following pressure conditions shall apply:

For plenum heights not greater than 1 m, the pressure in the furnace 100 mm below the soffit shall be maintained at + 5 Pa (+ 3 Pa) relative to outside the furnace.

For plenum heights greater than 1 m, the pressure in the furnace 100 mm below the soffit shall be maintained at +3 Pa of a pressure calculated as follows:

$$p = 0{,}66\ h \times 8{,}5 \quad (1)$$

where:

P = pressure in Pa

h = height of plenum below the raised floor in m

5.2.4 Open cavity barriers

For open cavity barriers the furnace pressure shall be monitored and controlled so that 5 min after the commencement of the test, the furnace pressure shall be 20 ± 5 Pa at a position 100 ± 10 mm below the bottom face of the cavity barrier (horizontal orientation) or 100 mm below the top of the furnace (vertical orientation). Ten minutes after the commencement of the test, the furnace pressure shall be 20 ± 3 Pa at a position 100 ± 10 mm below the bottom face of the open-state cavity barrier (horizontal orientation) or 100 mm below the top of the furnace (vertical orientation).

Laboratories should aim to achieve the specified pressures as soon as possible after commencement of the test. Furnaces should not be run under, for example negative pressure for the first few minutes and then the pressure only established just before 5 min.

For open cavity barriers tested using the thermal exposure of the removable shield, the pressure conditions in 5.2.3 might not be met immediately after the removal of the shield. In such cases, any pressure drop shall be corrected as quickly as possible and in any case within three minutes.

6 Test specimen

6.1 General

The test specimen shall consist of a cavity barrier mounted in a supporting construction.

6.2 Size

If, in practice, the height or width of the product is 3 m or smaller, then that dimension of the test specimen shall be tested at full size. If any dimension of the construction is greater than 3 m, then that dimension shall be tested at not less than 3 m.

A typical minimum length to width ratio for an open cavity barrier is 10:1. In order to maintain this ratio a test furnace of appropriate dimensions shall be used (see Clause 4).

For open cavity barriers, the distance between the long edge open cavity barrier and the outer perimeter of the heated part of the separating element shall be not less than 200 mm at any point in order to avoid boundary effects (see Clause 4).

6.3 Number

The number of test specimens shall be as given in EN 1363-1. However, where information is required under different boundary/exposure conditions or where an asymmetrical product is to be evaluated, additional tests shall be undertaken for each situation using separate test specimens. Where a cavity barrier is intended for use in both horizontal and vertical separating elements, both orientations shall be tested.

6.4 Design

6.4.1 General

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

Joints or splices for the purposes of erection, construction or expansion, shall be incorporated in the test specimen. Different jointing systems or splices may be included in a single test specimen provided that they are both subjected to furnace 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 that can be derived from the field of direct application (see Clause 13).

6.4.2 Test configuration

Four test configurations appropriate to the end uses of cavity barriers are considered in this document:

1. Above suspended ceilings and in lofts and other roof voids to prevent horizontal fire spread.

2. Below raised access floors between the underside of the raised floor and the upper side of the structural floor slab. Special considerations for testing these are given in Annex A.

3. Fire stopping between leaves of, for example masonry walls to prevent vertical or horizontal fire spread between the leaves. Special considerations for testing these are given in Annex B.

4. Open cavity barriers installed as part of external walls, for example facades and roof eaves. Special considerations for testing these are given in Annex C.

6.4.3 Boundary/restraint conditions

The test specimen shall be installed with boundary and restraint conditions representative of those found in practice.

Where, in practice the width of the product is larger than the front opening of the furnace, one vertical edge shall be left unrestrained and there shall be a gap of 25 mm to 50 mm between the free edge of the test specimen and the test frame. This gap shall be packed with a resilient non-combustible material (e.g. mineral fibre) to provide a seal without restricting freedom of movement. The remaining edges shall be restrained as in practice.

6.4.4 Penetrating services

In some cases pipes, cables or other services may pass through a cavity barrier. In this case, the cavity barrier shall be treated as a penetration sealing system and shall be tested in accordance with EN 1366-3.

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

The test specimen shall be installed in the test frame and, if used, the supporting construction, as in practice.

Where voids exist within a 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.

7.2 Standard supporting construction

7.2.1 General

If the size of the test specimen is smaller than the opening in the test frame then it shall be installed in the test frame using one of the following approaches:

7.2.2 Vertically oriented test specimens

a) Where the height of the test specimen is smaller than the height of the test frame opening, a plinth shall be provided to reduce the opening to the required height. The plinth shall possess sufficient stability for the test specimen and shall be selected from one of the rigid standard supporting constructions in EN 1363-1.

b) Where the width of the test specimen is smaller, a standard supporting construction shall be provided on the vertical sides of the opening selected from either the rigid or flexible standard supporting constructions given in EN 1363-1.

7.2.3 Horizontal test specimens

Where the area of the test specimen is smaller than the area of the test frame opening, then the furnace opening shall be reduced to the area of the test specimen using a suitable construction. In the absence of horizontal standard supporting construction in EN 1363-1, gas concrete or dense concrete slabs shall be used for horizontal specimens.

7.2.4 Open cavity barrier specimens

For open cavity barriers, the supporting construction shall comprise either autoclaved aerated concrete, density: (650 ± 200) kg/m^3 or dense concrete, density (2,400 ± 200) kg/m^3.

7.3 Splice locations for open cavity barriers

Where splices (see 3.3) 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 200 mm. All fixing methods including, for example brackets, each side of a splice shall be included where possible.

7.4 Non-standard supporting construction

If the test specimen is mounted in a supporting construction not given in EN 1363-1 or described in 7.2, then the result will only be valid for cavity barriers mounted in the construction as tested.

8 Conditioning

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