SLOVENSKI STANDARD
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Preskusi požarne odpornosti nosilnih elementov - 2. del: Stropi in strehe

Fire resistance tests for loadbearing elements - Part 2: Floors and roofs

Feuerwiderstandsprüfungen für tragende Bauteile - Teil 2: Decken und Dächer

Essais de résistance au feu des éléments porteurs - Partie 2: Planchers et toitures

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ICS:

13.220.50	Požarna odpornost gradbenih materialov in elementov	Fire-resistance of building materials and elements
91.060.20	Strehe	Roofs
91.060.30	Stropi. Tla. Stopnice	Ceilings. Floors. Stairs

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EUROPEAN STANDARD

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Fire resistance tests for loadbearing elements - Part 2: Floors and roofs

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Contents

Page

Foreword

This document (EN 1365-2:2014) 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of an identical text or by endorsement, at the latest by May 2015, and conflicting national standards shall be withdrawn at the latest by May 2015.

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This document supersedes EN 1365-2:1999.

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1 Scope

This European Standard specifies a method for determining the fire resistance of:

- floor constructions, without cavities or with unventilated cavities;

- roof constructions, with or without cavities (ventilated or unventilated);

- floor and roof constructions incorporating glazing;

with fire exposure from the underside.

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

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 1363-1:2012, *Fire resistance tests - Part 1: General Requirements*

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

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

3 Terms, definitions, symbols and designations

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

3.1 Terms and definitions

3.1.1
floor construction
a horizontal separating element of building construction which is loadbearing

3.1.2
roof construction
a horizontal or sloped separating element of building construction which is loadbearing and includes the roof covering

3.1.3
ceiling
a lining plus any supporting framework, including hangers, fixings and any insulation material. The ceiling may be attached directly to the structural building member or be suspended from it or be self supporting (see Figure 1)

3.1.4
ceiling system
the full ceiling assembly submitted for test, including hangers and fixings, e.g. lighting and ventilation ductings and access points

3.1.5
cavity
the space between the upper surface of the ceiling and the underside of any floor, roof or its supporting construction

3.1.6
roof construction incorporating glazing
a roof construction as defined in 3.1.2 with one opening in which a glazed element is built in, with or without shared transoms or mullions

3.1.7
fire resistant glazing
a glazing system consisting of one or more transparent or translucent panes with a suitable method of mounting, with e.g. frames, seals, fixing materials, et, capable of satisfying the appropriate fire resistance criteria

3.1.8
insulated glazing
fire resistant glazing which satisfies both the integrity and insulation criteria for the anticipated fire resistance period

3.1.9
uninsulated glazing
fire resistant glazing which satisfies the integrity and, where required, the radiation criteria for the anticipated fire resistance period but which is not intended to provide insulation

3.1.10
glazed elements
building elements with one or more (light transmissive) panes, that are built in a frame with fixings and seals

3.1.11
pane
a single piece of monolithic or laminated glass, or an insulated glass unit (IGU)

3.1.12
aspect ratio
the ratio of the height of a pane to its width

3.1.13
mullion
a vertical framing member of a sloped construction, separating and supporting two adjacent panes of glass or panels

3.1.14
transom
a horizontal framing member of a sloped construction, separating and supporting two adjacent panes of glass or panels

3.2 Symbols and designations

Symbol	Unit	Description
L_{exp}	mm	Length of the test specimen exposed to heating.
L_{sup}	mm	Length of test specimen between centers of supports (this is equivalent to 'L' in EN 1363-1).
L_{spec}	mm	Length of the test specimen.

W_{exp}	mm	Width of the test specimen exposed to heating.
W_{sup}	mm	The transverse span of a two way spanning test specimen.
W_{spec}	mm	The width of the test specimen.
Am/V	m^{-1}	Section factor of steel beams
Am	m	Surface area of a member per unit length
V	m^2	Volume of a member per unit length
α	degrees	Inclination angle

4 Test equipment

The test equipment shall be as specified in EN 1363-1, and if applicable EN 1363-2.

5 Test conditions

5.1 Furnace

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

b) In addition to a) the following applies:

- The furnace pressure conditions shall be established 100 mm below the pressure reference line, see Figure 1.

- For inclined test specimen, the furnace pressure conditions shall be established 100 mm below the pressure reference line at the highest possible position, see Figures 1 and 2.

5.2 Loading conditions

The test specimen shall be subjected to loads determined in accordance with EN 1363-1. The determination of the load shall be clearly indicated in the test report.

The magnitude and the distribution of the load shall be such that the maximum moments and shear forces produced in the test specimen are representative of, or higher than those expected in practice.

The load shall be applied uniformly, e.g. by a point loading system.

Point loads shall be transferred to the test specimen through distribution plates; the total contact area between these and the floor surface shall be not more than 0,09 m^2 individually, or 16 % of the total surface area collectively.

If the plates are made of steel or of materials with a similar high conductivity, they shall be insulated from the surface of the test specimen.

The loading equipment shall not inhibit the free movement of air at the top of the test specimen and, other than at the loading points, no part of the loading equipment shall be closer than 60 mm to the unexposed surface of the test specimen.

6 Test specimen

6.1 General

Additional guidance on design of roof and floor constructions incorporating glazing is given in Annex A.

6.2 Size

a) The test specimen shall be full size unless the actual size is larger than can be accommodated in the furnace.

b) When the actual size cannot be accommodated in the furnace, the dimensions of the test construction shall be such that at least the following dimensions of the test specimen are exposed to the fire:

- exposed length (L_{exp}): 4 m;

- exposed width (W_{exp}): 3 m.

One way spanning floor or roof constructions, without ceilings, may have an exposed width between 2 m and 3 m, provided the relevant requirements given in 6.4 are accommodated.

For floor and roof constructions with suspended or self supporting ceilings, L_{exp} and W_{exp} shall be related to the surface of the ceiling.

c) For floor or roof constructions with structural members that span one way only, the following specifications with respect to the span and length of the test specimen apply:

- span (L_{sup}): L_{exp} plus up to half the length of the bearing at each end. The length of the bearing shall be selected so that the difference between [L_{sup}] and [L_{exp}] is kept to a minimum or as in practice, whichever is the smaller.

- length (L_{spec}): L_{exp} plus up to 500 mm at each end (see Figure 3).

d) For floor or roof constructions with structural members that span two ways, 6.2 c) applies to the main span. The span and width of the test specimen in the other direction shall be:

- span (W_{sup}): W_{exp} plus up to half the length of the bearing at each end;

- width (W_{spec}): W_{exp} plus up to 500 mm at each end.

6.3 Number

6.3.1 General

One test specimen shall be tested for each specified support/restraint, or exposure and loading condition.

More than one test will be necessary if one test cannot adequately cover all of the constructional variations given in 6.4.

6.3.2 Pitched roof constructions without glazing

In addition to 6.3.1 the following apply:

a) Trussed rafter roof constructions shall be tested for each inclination of the bottom member (chord) (see 13d)).

b) For apex or monopitch roof constructions with a span normal to the inclination, the number of tests depends on the tested inclination and the required validity of the test result (see 13 d)).

6.4 Design

6.4.1 General

The test specimen shall simulate the conditions of the use of the floor or roof construction in practice. It shall include all construction details, materials and components, (including water proofing) and shall be supported in accordance with 6.4.6.

An example of each type of joint or junction contained within the element for purposes of erection, construction or expansion, shall be incorporated in the test construction, even though such joints occur at greater centers than the relevant dimension of the test specimen.

Different jointing systems shall not be included in a single test specimen, unless it can be shown that they will not interfere with the performance of each other.

As the evaluation of fire spread through cavities or combustible parts within the structure is not part of the scope of this standard, all the edges of the test specimen can be protected from fire spread by suitable means for the purpose of the test. The means of protection shall not contribute to the loadbearing capacity of the construction and its size shall be kept to minimum to avoid downsizing of the fraction of the actual construction represented by the test specimen.

6.4.2 Floor or roof construction

a) The distance between the furnace wall or the associated construction and the nearest side of the beam or joist along the free edges shall be representative for the situation in practice.

b) For a construction containing beams with an exposed width greater than 3 m, the distance of both edge beams to the nearest centre beams may be reduced. In this case additional loading shall be applied on them to produce stress levels equal to those in the other beams.

c) The connections/junctions of the periphery of the floor or roof construction with the supporting construction shall be carried out in accordance with the sponsor's instructions. At the free edges of a one way spanning structure, the peripheral conditions shall allow freedom for deflection. The gaps at these edges shall be sealed with mineral wool and/or other materials according to the sponsor.

6.4.3 Ceiling system

a) The test specimen shall reproduce the conditions of use, including junctions between the ceiling, walls and edge panels, joints and jointing materials and shall be installed from below by the same method and procedures as given in the installation manual, or in written instructions, which shall be provided by the sponsor.

b) It shall be fitted with all the components for hanging, expansion and abutting, plus any other fixtures defined by the sponsor, with a frequency representative of practice. For ceilings which are suspended from the structural building member by hangers, the suspension system shall be representative of that used in practice.

c) The profiles bearing the various panels shall be installed against each other without any gap, unless a gap (or gaps) is required for design purposes. In this case the gap at the junction of the main supporting profiles shall be representative of that to be used in practice and shall be installed within the specimen and not at its perimeter. The profiles within the test assembly shall include a joint representative of joints to be used in practice in both longitudinal and transverse directions. Such junction and joints shall not be installed within 500 mm from any edge of the ceiling unless this is the recommended practice.

d) The assembly between the ceiling and the supporting construction or test frame shall reproduce that to be used in practice. Grid members shall be tightly fitted to the test frame or the supporting construction, without any gap, in order that the thermal expansion behaviour of grid members and expansion devices is correctly evaluated. However, if in practice a gap is used, this gap shall be incorporated in the test specimen.

e) If the longitudinal and transverse directions of the ceiling are constructed differently the performance of the specimen could vary depending upon which components are aligned with the longitudinal axis. The specimen shall therefore be tested in the most onerous orientation by arranging the more critical components parallel to the longitudinal axis. If the more onerous orientation cannot be identified two separate tests shall be carried out with the components arranged both parallel and perpendicular to the longitudinal axis.

f) If fixtures and fittings are to be installed, the fire resistance of the ceiling system, without such fixtures and fittings, shall have been evaluated previously. When testing with fixtures and fittings the method of installation and frequency of use of these shall be representative of that used in practice. Such fixtures and fittings shall not be installed within 500 mm from any edges of the ceiling.

g) Self supporting ceilings shall be fixed to the test frame or the supporting construction on three edges, the free edge shall be parallel to the direction of the span.

h) Suspended ceilings shall be fixed on four edges to the test frame or the supporting construction.

i) When pitched roof constructions with suspended ceilings are tested horizontally, the height of the cavity of the test construction shall be equal to half the maximum cavity height of the construction in practice, with a tolerance of ± 20 %.

6.4.4 Pitched roof constructions

a) Trussed rafter roof constructions shall be tested as complete structures for any inclination of the bottom member (chord).

b) Apex roofs when not a trussed rafter construction shall be tested as shown in Figure 2.

c) Apex and monopitch roof constructions shall be tested horizontally with the test results applicable to all angles with the exception of those specified in 6.3.2 b).

6.4.5 Floor and roof constructions incorporating glazing

a) The test specimen shall incorporate the largest pane and area of glass which is intended to be used in practice.

b) For pitched constructions in which glazing can be installed with the lowest dimension either parallel or normal to the inclination, the largest pane of glass shall be installed in the most onerous orientation. The selection of the most onerous orientation shall be explained in the test report.

c) If the glazing incorporates shared transom(s) or mullion(s), at least one of each shall be incorporated into the test specimen.

6.4.6 Support and restraint conditions

6.4.6.1 Floor constructions and roof constructions without glazed elements

a) Standard conditions

The floor or roof construction shall be tested as a simply one way spanning structure with an exposed surface and span as defined in 6.2. It shall be mounted to allow freedom for longitudinal movement and deflection.