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Fire resistance tests for loadbearing elements – Part 1: Walls

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Provning av brandmotstånd – Bärande byggnadsdelar – Del 1: Väggar

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Fire resistance tests for loadbearing elements - Part 1: Walls

Essais de résistance au feu des éléments porteurs - Partie
1: Murs

Feuerwiderstandsprüfungen für tragende Bauteile - Teil 1:
Wände

This European Standard was approved by CEN on 18 February 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by February 2000, and conflicting national standards shall be withdrawn at the latest by February 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the Construction Products Directive.

EN 1365 'Fire resistance tests for loadbearing elements' consists of the following

Part 1: Walls

Part 2: Floors and roofs

Part 3: Beams

Part 4: Columns

Part 5: Balconies (in course of preparation)

Part 6; Stairs and walkways (in course of preparation)

Introduction

The purpose of this test is to measure the ability of a representative specimen of a loadbearing wall to resist the spread of fire from one side to another and to maintain its loadbearing capacity. It is applicable to internal and external walls.

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, 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 Part of EN 1365 specifies a method of testing the fire resistance of load bearing walls. It is applicable to both internal and external walls. The fire resistance of external walls can be determined under internal or external exposure conditions.

The fire resistance performance of load bearing walls is normally evaluated without perforations such as glazing. If it can be demonstrated that the design of the opening is such that load is not transmitted to the perforation, then the perforation need not be tested in the loaded condition.

If perforations are to be included the effects of these will need to be separately established. The performance of fire resistant glazing is addressed in EN 1364-1.

This test method is not applicable to:

- i) curtain walls (non-loadbearing external walls suspended in front of the floor slab) which are considered specifically in prEN 1364-3.
- ii) walls containing door assemblies which shall be tested to EN 1634-1.
- iii) non-separating load bearing walls which, in short widths, can be tested as columns to EN 1365-4.

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

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- 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
- prEN 1364-3 Fire resistance tests for non-loadbearing elements Part 3 Curtain walls - full configuration
- EN 1365-4 Fire resistance tests for loadbearing elements Part 4 Columns
- EN 1634-1 Fire resistance tests for door and shutter assemblies Part 1 Fire doors and shutters
- prEN ISO 13943 Fire safety - Vocabulary (ISO/DIS 13943:1998)

3 Definitions

For the purposes of this Part of EN 1365 the definitions given in EN 1363-1 and prEN ISO 13943, together with the following, apply:

3.1 loadbearing wall: A wall designed to support an applied load.

3.2 internal wall: A wall which provides fire separation. It may be exposed separately to a fire from either side.

3.3 external wall: A wall forming the external envelope of a building which may be exposed separately to an internal or an external fire.

3.4 insulated wall: A wall, with or without glazing, which satisfies both the integrity and insulation criteria for the anticipated fire resistance period.

3.5 uninsulated wall: A wall which satisfies the integrity and, where required, the radiation criteria for the anticipated fire resistance period, but which is not intended to provide insulation. Such a loadbearing wall may consist entirely of uninsulated fire resistant panels.

3.6 standard supporting construction: A form of construction used to close off the furnace and to support the loadbearing wall being evaluated and which has known resistance to thermal distortion.

3.7 plinth: A form of standard supporting construction that reduces the height of the opening by raising the support base to accommodate the test specimen.

3.8 separating wall: A wall provided within a building or between adjoining buildings to prevent the transfer of fire from one side to the other.

4 Test equipment

4.1 General

In addition to the test equipment specified in EN 1363-1, and if applicable EN 1363-2, the following is required:

4.2 Test frame

A test frame designed to accommodate the test specimen and apply the required test load. Examples of test frames which may be used for this purpose are shown in figures 1 and 2.

4.3 Loading equipment

The load to the test specimen may be applied by means of loading jacks located either at the top or the bottom of the frame. Where the loading is applied by a rigid beam it shall be of sufficient stiffness to ensure uniform vertical deflection along the test specimen. Where the load is applied individually to studs within the wall the loading system shall allow for maintenance of constant load at each loading point.

5 Test conditions

5.1 Furnace atmosphere

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

5.2 Loading and restraint

The load and restraint shall conform to the requirements given in EN 1363-1.

6 Test specimen

6.1 Size

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

6.2 Number

The number of test specimens shall be as given in EN 1363-1. However, where information is required under different exposure conditions additional tests shall be undertaken for each situation using separate test specimens.

6.3 Design

The test specimen shall be either:

- a) fully representative of the construction intended for use in practice, including any surface finishes and fittings which are essential and may influence its behaviour in the test,
- or,
- b) be designed to obtain the widest applicability of the test result to other similar constructions.

The design features which influence fire performance that should be included to give the widest application can be derived from the field of direct application, clause 13.

The test specimen shall not contain mixtures of different types of construction e.g. bricks or blocks in a wall unless this is fully representative of the construction in practice. Where the test specimen can incorporate at least two full width boards, a full size board shall be adjacent to an edge. When it is not possible to incorporate two full size boards into the test specimen, the single full size board shall be located in the centre of the specimen, with smaller boards of equal width on each side. The smaller boards shall not be less than 500 mm wide. Where the smaller boards would be less than 500 mm wide, only one shall be used (see figure 3).

6.4 Construction

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

6.5 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 construction shall be mounted in such a way that the whole of its exposed face (including edge conditions) shall be exposed to the heating conditions.

7.2 Supporting construction

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:

- a) Where the height of the test specimen is smaller than the height of the test frame opening, then a plinth shall be provided to reduce the opening to the required height.
- b) Where the width of the test specimen is less than the opening in the test frame, then the opening may be reduced with a suitable construction attached to the inside vertical faces of the test frame, but with a clearance of between 25mm to 50mm from the vertical edges of the test specimen.

In either case above the use of a supporting construction shall not influence the overall performance of the test specimen.

7.3 Loading and restraint of the test specimen

A gap of 25mm to 50mm shall exist between the vertical edges of the test specimen and the test frame or supporting construction so that both vertical edges have freedom of movement. 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 loading shall be applied to the test specimen either concentrically or eccentrically. The specimen shall be tested with only one edge hinged using the component illustrated in figures 1 and 2.

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 m² 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".

9.1.2 Unexposed face thermocouples

9.1.2.1 General

For uninsulated loadbearing walls, the temperature of the unexposed face is not required to be measured and no thermocouples are therefore required to be attached.

For walls with an anticipated insulation performance in excess of 5 min, thermocouples of the type specified in EN1363-1 shall be attached to the unexposed face for the purpose of obtaining the average and the maximum surface temperatures. Examples of location of unexposed face thermocouples are given in figures 4 to 13.

General rules for the attachment and exclusion of thermocouples given in EN 1363-1 shall apply.

9.1.2.2 Average temperature

a) Uniform walls

For test specimens which are uniform with respect to their expected thermal insulation, the average temperature of the unexposed face shall be measured by means of five thermocouples, one located close to the centre of the specimen and one close to the centre of each quarter section. Some typical examples are shown in figures 4 to 13.

b) Non-uniform walls

For test specimens of non-uniform walls, i.e. those which contain discrete areas $\geq 0,1 \text{ m}^2$ expected to exhibit different levels of insulation performance, each discrete area shall be individually monitored for average temperature rise. The average temperature rise shall be measured by thermocouples distributed over each discrete area. One thermocouple shall be provided for every $1,5 \text{ m}^2$ or part thereof of the specimen. A minimum of two thermocouples for each discrete area shall be provided.

9.1.2.3 Maximum temperature rise

For determination of maximum temperature thermocouples shall be applied to the unexposed face as follows:-

- a) at the head of the specimen at mid-width.
- b) at the head of the specimen in line with a stud/mullion.
- c) at the junction of a stud and a rail in a partition system.
- d) at mid height of one edge, 100 mm in from the edge.
- e) at mid width, where possible, adjacent to a horizontal joint (positive pressure zone).
- f) at mid height, where possible, adjacent to a vertical joint (positive pressure zone).

Thermocouples shall not be positioned closer than 100 mm from any discrete area that is not being evaluated for insulation.