BRITISH STANDARD

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1366-6:2004

Fire resistance tests for service installations —

Part 6: Raised access and hollow core floors

The European Standard EN 1366-6:2004 has the status of a British Standard

ICS 13.220.50

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 1366-6:2004.

The UK participation in its preparation was entrusted by Technical Committee FSH/22, Fire resistance tests, to Subcommittee FSH/22/13, Raised floors, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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Contents

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Foreword

This document (EN 1366-6:2004) 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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

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

EN 1366 ‘*Fire resistance tests for service installations*’ consists of the following:

Part 1: Ducts,

Part 2: Fire dampers,

Part 3: Penetration seals,

Part 4: Linear joint seals,

Part 5: Service ducts and shafts,

Part 6: Raised access and hollow core floors,

Part 7: Conveyor systems and their closures,

Part 8: Smoke extraction ducts ,

Part 9: Single compartment smoke extraction ducts ,

Part 10: Smoke control dampers,

Part 11: Fire protective systems for essential services .

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Introduction

In this standard a representative sample of a raised or hollow floor is exposed to a specified regime of heating and loading. The performance of the test specimen is monitored on the basis of criteria described in EN 1363-1. The fire resistance of the tested construction is expressed as the time for which the appropriate criteria have been satisfied.

Caution

The attention of all persons concerned with managing and carrying out this fire resistance test, EN 1366-6, is drawn to the fact that fire testing can be hazardous and that there is a possibility that toxic and/or harmful smoke and gases can be evolved during the test. Mechanical and operation hazards can 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 Part of EN 1366 specifies a method for determining the fire resistance of raised access floors and hollow floors when subjected to a fire from within the plenum beneath the floor. The fire exposure applied to the test specimen may be either:

a) standard time temperature curve;

b) 'reduced' time temperature curve which follows the standard time/temperature curve only up to 500 °C. After this temperature has been reached the temperature within the furnace is maintained at 500 °C.

This document does not determine the fire resistance of the sub-floor on which the raised or hollow floor is constructed; this is given in EN 1365-2.

2 Normative references

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

EN 1363-1:1999, *Fire resistance tests — Part 1: General requirements.*

EN 12825:2001, *Raised access floors.*

EN 13213:2001, *Hollow floors.*

EN ISO 13943:2000, *Fire safety — Vocabulary (ISO 13943:2000).*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1363-1:1999, EN 12825:2001, EN 13213:2001 and EN ISO 13943:2000 and the following apply.

3.1
raised access floor
factory made flooring system comprising panels supported on an under-structure of pedestals and/or stringers or other components as applicable, providing a load bearing structure for the fitting out of a building (EN 12825)

NOTE The under-structure is part of the raised access floor.

3.2
stringer
horizontal component connecting pedestals that may support a panel

3.3
hollow floor
loadbearing layer supported by a special understructure (which may include pedestals) in order to provide a space between the loadbearing layer and the base floor for installation of e.g. telecommunication services, electrical supplies, heating or air conditioning

3.4
sub-floor
horizontal element of building construction which is loadbearing and separating (constructional floor)

3.5
panel
loadbearing horizontal component of the access floor. It is supported by the under structure (e.g. pedestals and stringers) (EN 12825)

3.6
pedestal
vertical component or part of the element which transmits loading to the sub-floor (EN 12825)

3.7
plenum
available space between the underside of the panels of the access floor and the sub-floor (EN 12825)

3.8
plenum height
vertical distance between the highest point of the sub-floor and the lowest point of the underside of the access floor or hollow floor

3.9
associated construction
walls applied at the periphery of the test specimen representative of those in practice

3.10
fittings
items contained within raised access flooring systems or hollow flooring systems which penetrate panels or the hollow floor, e.g. ventilation grills, power sockets

3.11
unexposed face
upper surface of the raised or hollow floor, i.e. the opposite surface to the surface exposed to fire

4 Test equipment

The test equipment shall be as specified in EN 1363-1.

5 Test conditions

5.1 Furnace temperature

When testing using the standard time temperature curve, the furnace atmosphere and heating conditions shall conform to those given in EN 1363-1. When testing using the reduced time temperature curve, the furnace atmosphere shall conform to EN 1363-1 and the temperature in the furnace shall follow the standard time temperature curve until 500 °C has been reached.

5.2 Furnace pressure

5.2.1 Plenum heights not greater than 1,0 m

The pressure in the plenum 100 mm below the lowest point of the underside of the panel or horizontal part of the floor shall be maintained at (+ 5 ± 3) Pa relative to the outside of the furnace.

5.2.2 Plenum heights greater than 1,0 m

The pressure in the plenum 100 mm below the lowest point of the underside of the panel or horizontal part of the floor shall be maintained at a pressure calculated as follows:

$$p = 8{,}5\ h - 3{,}5$$

where

p = pressure in Pa;

h = height of plenum in m.

5.3 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 sponsor shall decide on the magnitude and distribution of the load, which may be uniformly distributed or applied to discrete areas.

NOTE 1 Figure 1 shows a suggested pattern of distribution for applying load to discrete areas.

NOTE 2 The level of load required may be subject to national provisions. A suggested minimum value of the test load is 1,5 kN/m^2.

Loading may be applied using weights, hydraulic rams or other mechanical systems. The total contact area of the loading equipment on the floor surface shall be not more than 0,09 m^2 at any individual loading position or 20 % of the total surface area collectively.

If the load is applied via materials with a high conductivity, e.g. steel plates, then 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 Size

a) The test specimen shall be full size unless the actual size is larger than the size that 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: 4 000 mm,

— exposed width: 3 000 mm.

6.2 Number

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 6.3.

6.3 Design

6.3.1 General

The test specimen shall be fully representative of the construction used in practice.

Different types of raised or hollow floor systems shall not be included in a single test specimen.

6.3.2 Joints

An example of each type of joint or junction contained within the raised or hollow floor, for the purposes of erection, construction or expansion, shall be incorporated in the test specimen. Different jointing systems, other than those required to represent the actual floor, shall not be included in a single test specimen.

6.3.3 Boundary conditions

The test specimen shall be installed with boundary and restraint conditions as found in practice. In the vast majority of cases raised and hollow floors are installed restrained on all edges, in which case any framing and/or panels shall be tightly fitted to the test frame, furnace walls or associated construction (as appropriate), without any gap, to ensure that the thermal expansion behaviour is fully evaluated.

The support and restraint conditions shall be fully described in the test report.

6.3.4 Axis of installation

If the longitudinal and transverse directions of the raised or hollow floor 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 installed so as to represent the most onerous condition by arranging the more critical components parallel to the longitudinal axis. If the more onerous condition cannot be identified, two separate tests shall be carried out with the components arranged both parallel and perpendicular to the longitudinal axis.

6.3.5 Fittings

Any fittings shall be included at the number and spacing representative of practice. Such fittings shall be installed as in practice.

6.3.6 Size of panels (raised floors only)

The size of the panels shall be chosen by the sponsor. This may have an effect of the field of direct application of results.

6.3.7 Fixing of pedestals (under-structures)

Raised and hollow floors are often installed in practice with pedestals fixed to the sub-floor either by gluing or by mechanical fixing. The installation of the pedestals in the fire resistance test, using fire protected beams or masonry/concrete elements to simulate the sub-floor is unrepresentative and consequently there is no point in evaluating the bonding of the pedestals to such structures. It is recommended that the pedestals are not fixed to the construction simulating the sub-floor in the test as this represents a worst case situation.

NOTE Testing raised floors with pedestals fixed to the construction simulating the sub-floor will restrict the field of direct application of the result to the fixing method used in the test only.

6.3.8 Cut panels (raised floors only)

If a raised access floor incorporates cut panels, the test specimen shall incorporate a minimum of one row of cut panels.

6.3.9 Floor coverings

The test specimen shall be tested without any floor coverings, e.g. carpet, unless such a floor covering is an integral and structural part of the floor.

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 the test specimen

The test specimen shall be installed in a manner representative of its use in practice.

8 Conditioning

The test specimen 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 orientated so that side 'A' faces the floor of the furnace. For test specimens with less than 6 m^2 exposed surface area, a minimum of four plate thermometers shall be used.

9.1.2 Unexposed surface thermocouples

9.1.2.1 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. For the location and number of these thermocouples refer to EN 1363-1.

9.1.2.2 Thermocouples for measuring the average temperature rise

a) The average temperature rise shall be measured with five thermocouples in positions specified in EN 1363-1, i.e. located at, or immediately near, the centre of the test specimen and at, or immediately near, the centre of each quarter section.

b) When the test specimen has insulated parts with different thicknesses, the number of thermocouples on the unexposed face shall be increased to six to provide equal numbers of thermocouples at the maximum and minimum thicknesses.

c) For a test specimen which contains discrete areas ≥ 0,1 m^2 expected to exhibit different levels of insulation performance, each discrete area shall be monitored for average temperature rise. The average temperature rise shall be measured by thermocouples evenly distributed over each discrete area. One thermocouple shall be provided for every 1,5 m^2 or part thereof of the test specimen. A minimum of two thermocouples for each discrete area shall be provided.

9.1.2.3 Thermocouples for measuring the maximum temperature rise

a) Additional thermocouples shall be attached to measure the maximum temperature rise at locations where higher temperature conditions are expected to exist, on locations in accordance with EN 1363-1 and with a minimum of two per feature.

9.2 Pressure

The furnace pressure shall be measured at locations with pressure sensors as prescribed in EN 1363-1.

9.3 Deflection

Due to the nature of raised access floors and hollow floors, which are supported at many positions over the area of the test specimen, it is not possible to determine the location where the maximum deflection is expected to occur. Consequently accurate measurement of deflection of the test specimen in accordance with EN 1363-1 is not required.

10 Test procedure

10.1 General

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

10.2 Application and control of load

The load shall be applied and controlled in accordance with EN 1363-1.

10.3 Furnace control

The furnace temperature and pressure shall be measured and controlled in accordance with EN 1363-1.

10.4 Observations during the test

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

10.5 Termination of test

The test shall be terminated for one or more of the reasons given in EN 1363-1.

11 Performance criteria

11.1 Loadbearing capacity

Due to the nature of raised access floors and hollow floors, which are supported at many positions over the area of the test specimen, the failure criteria given in EN 1363-1 which relate to flexural elements are not applicable.

Failure of loadbearing capacity is deemed to have occurred when the test specimen can no longer support the applied load, i.e. when the floor itself or one of its supporting members has collapsed.

11.2 Other criteria

All other criteria by which the performance of the specimen is judged by are given in EN 1363-1.

12 Test report

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

a) reference that the test was carried out in accordance with EN 1366-6;

b) whether the standard time temperature curve or the reduced time/temperature curve was used;

c) details of the pressure conditions within the plenum;

d) details of the load and its distribution.

13 Direct application of the test results

13.1 General

The test results are directly applicable to similar untested raised or hollow floor constructions with the following provisions.

13.2 Size of raised or hollow floor

If the size of the test specimen was less than 4 m by 3 m then only sizes up to the tested construction are permitted.

If the size of the test specimen was 4 m by 3 m then unrestricted size increases are permitted provided that the distance between the pedestal centres are the same or less than those tested.

13.3 Boundary/restraint conditions

Changes to the boundary/restraint conditions are not permitted.

13.4 Panels

Changes in the materials or the design of panels are not permitted.

The linear dimensions (width/length) of panels may be decreased but not increased.

The thickness of panels may be increased but not decreased, provided that the stress level in the supporting construction (e.g. pedestals/under-structures) has not been increased.

13.5 Pedestals

Changes in the materials or the construction of pedestals are not permitted.

The height of pedestals may be decreased but not increased.

The distances between the centres of pedestals may be decreased but not increased.

The cross section of the pedestals may be increased but not decreased.

13.6 Fixing of pedestals to sub-floor (raised floors only)

Changes to the method of fixing pedestals to the sub-floor are permitted if the pedestals were not fixed to the construction representing the sub-floor in the test.

No changes to the method of fixing pedestals to the sub-floor are permitted if the pedestals were fixed to the construction representing the sub-floor in the test.

13.7 Fittings

Fittings may only be included in a raised or hollow floor if they have been tested in accordance with 6.3.5.

13.8 Cut panels (raised floors only)

Cut panels are only permitted to be used if incorporated in the test specimen in accordance with 6.3.8.

13.9 Plenum

The height of the plenum may be decreased (e.g. by reducing in the height of pedestals) but not increased.

13.10 Loading

The level of loading may be decreased but not increased. If the load was applied in discreet areas in the test, then the load used in practice may also be applied discretely provided both the total load and the load at any discrete location are no greater than those used in the test.

13.11 Temperature/time curve

Raised access and hollow floors tested using the standard time temperature/time curve may be used where the reduced temperature/time curve is required. The converse is not permitted.

Annex A
(informative)

Guidance on the provision of support for raised or hollow floors inside the furnace

A.1 Introduction

This Annex gives guidance to laboratories wishing to test raised or hollow floors on how to support them for testing in a horizontal furnace. Extra support is required because the height of most raised access or hollow floors is generally under 500 mm while most horizontal, or floor furnaces are in excess of 1 m deep. Erecting the raised access or hollow floors on the floor of the furnace would mean that the top surface of the test specimen would be at or below the burner line. Increasing the height of the pedestals or other supporting devices would put the floor at the correct level, but evaluating such a specimen would not be realistic as the supporting members would be much longer than in practice. This is also likely to give a worse result than with the length of pedestal used in practice.

Two alternatives are provided. One is to effectively raise the floor level of the furnace by erecting small columns using bricks or concrete blocks on which to support the pedestals in the normal way. The other is to provide steel beams to support the pedestals. These would be fire protected for at least the anticipated period of fire resistance of the raised or hollow floor under test.

A.2 Method of support using pillars

For each pedestal or other supporting member, provide a supporting pillar with sides of length between 200 mm and 300 mm and cross sectional area of between 0,04 to 0,09 m^2. The pillar may be made from bricks (not hollow clay), concrete blocks (not aerated) or other previously cast dense concrete (> 1 750 kg/m^3) items and may be erected on the floor of the furnace using water based mortars.

It is not critical that the pillar components are fully conditioned in accordance with EN 1363-1. However, the blocks, bricks or other items should be dry to prevent excessive moisture in the furnace affecting the heating conditions. For this reason it is not recommended that large concrete slabs be used for this purpose unless they are fully dried out before use in the test. Any water based mortars used in constructing or securing the pillars to the furnace floor should have at least 3 days to dry to allow sufficient bond strength to develop. It is recommended that pillars are wrapped in 25 mm of mineral fibre to prevent spalling/cracking during test.

The top surface of the pillar should be representative of that used in practice so that any adhesion, e.g. the use of adhesive between the base of the pedestal and the top of the pillar is as realistic as possible.

This method is not recommended for pillars of more than 600 mm long if they are of 0,04 m^2 or smaller cross sectional area or 1,2 m long if 0,09 m^2 cross sectional area. For raised access or hollow floors which need to be supported above 1,2 m high, the method of support using fire protected steel beams given below is recommended.

A.3 Method of support fire protected steel beams

For each row of pedestals or other supporting members, provide a supporting beam placed at an appropriate height in the furnace. The beam may run across the width or length of the furnace. The beam should be fixed to prevent any movement including resistance to rotation. For most purposes, hot rolled steel 'I' section beams with a minimum elastic modulus of 200 GN/m^2 and minimum section width of 100 mm (or the width of the pedestals, whichever is the larger) will be sufficient. The grade of steel should be a structural grade. Engineering grades should not be used.

Provide fire protection to the beams to ensure that the beams remain below 200 °C for at least the anticipated period of fire resistance for the raised access or hollow floor. Proprietary fire protection materials and techniques may be used or, alternatively, suitable quantities of stone wool or ceramic fibre may be wrapped/fixed securely around the beam. For the top surface it is recommended that a rigid fire protection material such as calcium silicate board is used rather than mineral fibre so as to provide a firm base for the pedestals.

NOTE If more than the minimum protection is provided then this may allow the test to run on longer if required and will also allow the beams to be re-used.

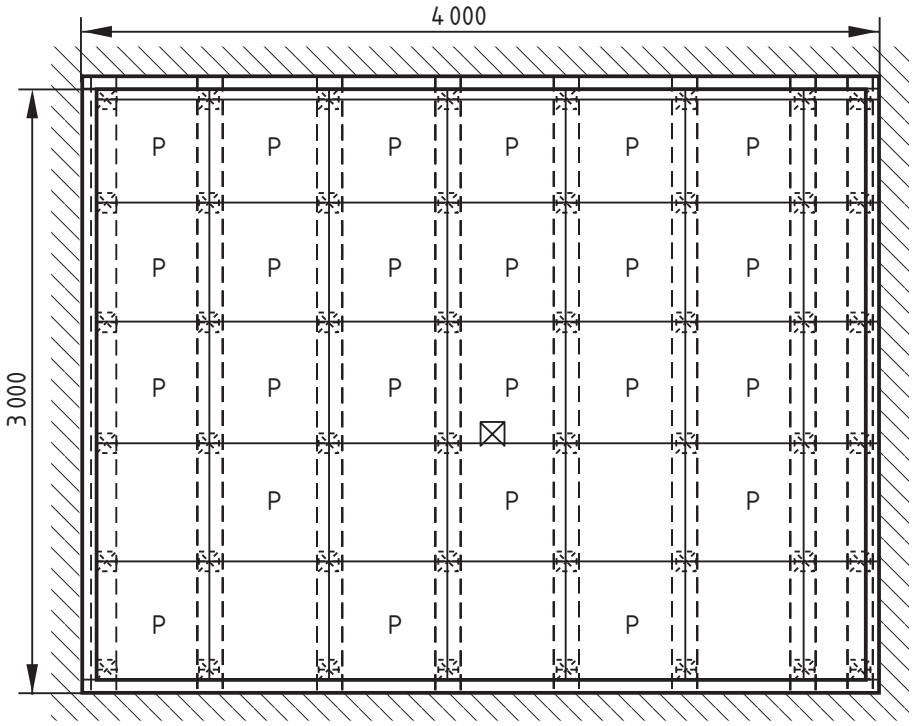

Figure 1 — Suggested pattern of distribution for applying load to discrete areas

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