BRITISH STANDARD

BS EN
13213:2001

Hollow floors

The European Standard EN 13213:2001 has the status of a British Standard

ICS 91.060.30

National foreword

This British Standard is the official English language version of EN 13213:2001.

The UK participation in its preparation was entrusted to Technical Committee B/550, Raised access floors, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible 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.

A list of organizations represented on this committee can be obtained on request to its secretary.

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This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 May 2001

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EN 13213

March 2001

ICS 91.060.30

English version

Hollow floors

Planchers creux

Hohlböden

This European Standard was approved by CEN on 20 January 2001.

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 Management Centre or to any CEN member.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 13213:2001 E

Content

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 323 " Raised access floors", the secretariat of which is held by SNV.

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of an identical text or by endorsement, at the latest by September 2001, and conflicting national standards shall be withdrawn at the latest by September 2001.

The annexes A and B are informative.

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.

Introduction

This standard has been prepared as a document for the design and production of hollow floors.

1 Scope

This standard specifies performance requirements and describes test methods for hollow floors for use in interior parts of buildings. This standard does not cover requirements related to dangerous substances which may be subject to regulations.

It contains information and requirements for the evaluation of conformity of the product to this European standard.

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 are listed hereafter. For dated references subsequent amendments to or revisions of any of these 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 (including amendments).

EN 196-1

Methods of testing cement - Part 1: Determination of strength

EN 1081

Resilient floor coverings - Determination of the electrical resistance

EN 1815

Resilient and textile floor coverings – Assessment of static electrical propensity

EN 12524

Thermal performance of building materials and products - Hygrothermal properties - Tabulated design values

EN 12664

Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Dry and moist products of medium and low thermal resistance

EN 12667

Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Products of high and medium thermal resistance

prEN 12825:1997

Raised access floors

prEN 13501-1:2000

Fire classification of construction products and building elements – Part 1: Classification using data from five reaction tests

prENV 61024-1:1995

Protection of structures against lightning – Part 1: General principles (IEC 61024-1:1990, modified)

EN ISO 140-12

Acoustics – Measurement of sound insulation in buildings and of building elements – Part 12 : Laboratory measurement of room to room airbone and impact sound insulation of an access floor (ISO 140-12:2000)

HD 384.4.473

Electrical installations of buildings – Part 4: Protection for safety; Chapter 47: Application of protective measures for safety; Section 473: Measures of protection against overcurrent

HD 384.5.54

Electrical installations of buildings – Part 5:Selection and erection of electrical equipment; Chapter 54: Earthing arrangements and protective conductors

HD 384.6.61

Electrical installations of buildings – Part 6: verification; Chapter 61: initial verification

ISO 48

Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply:

3.1

hollow floors

hollow floors consist of a load bearing layer supported by special understructures other than those specified in prEN 12825:1997 in order to provide a space between the load bearing layer and the base floor for installation of, for example, telecommunication services, electrical supplies, heating, air-conditioning etc.

3.2

component

part of hollow floor: e. g. supporting element, load bearing layer

3.3

collapse

state reached when deflection of the specimen will continue without further increase of the test load

3.4

deflection

movement of tested specimen caused by load expressed as a deviation from the former linear level

3.5

deviation

difference between a specified dimension or position and the actual dimension or position

3.6

finished floor height (FFH)

nominal vertical dimension from the specified sub floor level to the specified finished floor level

3.7

indentation

movement of the indentor into the specimen surface

3.8

kit

a construction product of at least two separate components that need to be put together on site to be installed permanently

3.9

load bearing layers

structural members which carry the imposed loads placed under the surface through the supports

3.10

plenum

available space below load-bearing layer and constructional floor of the building

3.11

plenum height

distance between the maximum upward tolerance of the sub floor and the maximum downward tolerance of the underside of the hollow floor layer

3.12

safety factor

the factor by which the ultimate load is divided to establish the working load

3.13

support

vertical component or part of the system which transmits loading to the subfloor

3.14

ultimate load

maximum load at the time of failure of the element during the specified ultimate load test procedure

3.15

working load

load given by dividing the ultimate load by the safety factor (ultimate load is sometimes called failure load and working load is sometimes called design load as well as nominal load)

4 Requirements

4.1 Loading

4.1.1 Load classes

The load bearing capacity of a hollow floor depends on the way of construction and the solidity of the load bearing layer.

Requirements to the load bearing capacity apply to each area which is normally accessible by the user.

The ultimate load is the only criterion for the classification. All other load bearing characteristics are correlated to the safety load.

The system shall be described and classified, and shall meet the requirements so far as they are relevant for the hollow floor. The hollow floor shall be designed in such a way that the requirements for the system shall be met.

NOTE Uniformly distributed loads should not be taken as a load bearing characteristic. The relevant load bearing characteristic is limited by the point load.

Hollow floors are graded in accordance with the ultimate load in accordance with table 1.

Table 1 - Load classes of hollow floor system

Class	Ultimate load KN
1	≥ 4
2	≥6
3	≥8
4	≥9
5	≥10
6	≥12

Applicable safety factors are either 2,0 or 3,0 depending on the specific or local requirements.

4.1.2 Ultimate load

When subjected to the test described in 5.1, the specimen shall sustain the appropriate safety load for its grade as shown in table 1, for three measurements without collapsing.

4.2 Deflection

The maximum deflection of the element shall not exceed 1/300 of the length of the grid while subject to the working load.

4.3 Solidity of load bearing layer

The solidity of the load bearing layer is an important criterion for the load bearing capacity of the whole system.

The manufacturer has to document the value of solidity (bending- and compressive strength tested in accordance with EN 196-1) of the load bearing layer which was used in test and further has to meet this value on site.

4.4 Dimensional deviations

4.4.1 Thickness of the load bearing layer

Requirements for the thickness of the load bearing layer and deviations depend on the system stated by the manufacturer. A minimum thickness shall be specified in accordance to table 2 by the manufacturer which will allow the floor to meet the specified load bearing requirements.

4.4.2 Deviations of the surface flatness

Deviations of flatness in the surfaces of hollow floors shall comply to the values given in table 2.

Table 2 - Surface deviations from flatness

	Deviation from a flat level at a distance between two positions		
Distance	0,1 m ≤1 m	> 1 m ≤ 4	> 4 m
Allowed deviation	2 mm	4 mm	10 mm

NOTE For distances in between these values, the deviations have to be interpolated.

4.4.3 Deviations from the datum

The horizontal level of the complete surface has to meet the 0° level with deviations as given in table 3.

Table 3 - Datum deviations

	Deviation from the 0° level at a distance between two positions				
Distance	1m to 3 m	> 3m to 6m	> 6m to 15m	> 15m to 30 m	> 30m
allowed deviation	8 mm	12 mm	16 mm	18 mm	20 mm

4.4.4 Positions of cutouts

When leaving cutouts in the load bearing layer during fabrication or later, deviations from the nominal range shall not exceed a level at which functional problems may occur. Cutouts shall be made within the specified general tolerances.

4.5 Reaction to fire

Where required, the hollow floor shall be classified for its reaction to fire according to prEN 13501-1:2000. Where the test method permits a representative portion of the hollow floor to be tested, this shall be done in accordance with the provisions of that method. Where not possible, reaction to fire testing and classification shall be on the basis of the performance of each component and/or material making up the hollow floor. In this case, results for the hollow floor shall be based on stating the reaction to fire classification of each component and/or material.

Where materials or components may be classified as reaction to fire Class A1 without the need for testing[1], this shall be stated for that material or component.

4.6 Resistance to fire

Where required, the hollow floor shall be classified for its resistance to fire according to prEN 13501-2:2000.

4.7 Electrostatic conductivity

The system shall comply with EN 1081, EN 1815 and HD 384.6.61.

[1] See Commission Decision 96/603/EC

4.8 Risk of electrocution

The element shall comply with HD 384.5.54, HD 384.4.473.

NOTE Other standards on components are under preparation by CENELEC/BTTF 62-2. Until these European Standards become valid national standards or regulations should be complied with.

In addition the element shall comply with European standards in respect of risk of electrocution if existing. In the absence of such standards, elements shall comply with requirements valid in the place of use of the product.

4.9 Acoustic insulation

Where required the impact and/or airborne sound insulation of the hollow floors shall be tested in accordance to EN ISO 140-12.

4.10 Protection against corrosion

The element shall comply with European standards in respect of protection of metallic materials against corrosion if existing. In the absence of such standards, elements shall comply with requirements valid in the place of use of the product.

4.11 Thermal conductivity

Where required, the thermal conductivity shall be determined in accordance to

EN 12524 or by testing to EN 12644 or EN 12667.

4.12 Absorption of hard body impact

Where required, the system shall sustain a hard body impact test as described in 5.6. This test shall not cause the system of the hollow floor to collapse, requiring that the test result be stated only if the test has been performed.

4.13 Ventilated floors

If the floor void is to be used for air conditioning or ventilation purposes, connections to adjacent partitions or outlets shall be constructed.

Perimetral connection: $a < 0{,}5\ m^3/(m\ h)\ (10\ Pa)^{2/3}$

Outlets: $a < 1{,}25\ m^3/(m\ h)\ (10\ Pa)^{2/3}$

a = value of leakage at gaps

5 Test- and measurement methods

5.1 General

The test report shall contain the following minimum information for all tests:

1) Name and address of testing body;

2) Name and address of the applicant;

3) Date of submittal of samples or sampling of test specimens;

4) Date of test;

5) Environmental conditions;

6) Description and construction details (include grade and classification details) of materials submitted for tests.

7) Accuracy and precision of test equipment used;

8) Numeric results of measurement of tests as stipulated and the classes or grade reached;

9) Statement of PASS or FAIL for hard body impact test , if relevant, and any damage which occurred;

10) Signature and designation of person responsible.

5.2 Ultimate load

5.2.1 Sampling

The test specimen is produced at the testing laboratory as stated and determined by the manufacturer. The thickness and type of the load bearing layer shall be representative of that to be used on site. The manufacturer shall state the size of the specimen as well as the time span between casting the load bearing layer and testing the element.

5.2.2 Test conditions

The test is carried out at a temperature of 20 °C ± 3 °C and 55 % ± 20 % RH (relative humidity).

5.2.3 Principle

A steadily increasing load is applied to an element until failure of the element occurs.

5.2.4 Test arrangement

The test arrangement shall be in accordance with figure 1 or equivalent.

5.2.5 Procedure

Place the specimen on a rigid surface. Apply the load on the stated position in the second full grid as shown in figure 1. Clean and sand the load-bearing layer to a flat level at the indentor position.

Apply the load with a steel indentor size 25 mm.

Place a rubber plate of 3 mm thickness and 65 shore A hardness in accordance with ISO 48 between indentor and specimen.

Carry out the test at positions on the specimen identified as points of weakness. To identify a point of weakness, carry out the tests:

- at the centre of a grid, pos. 1;

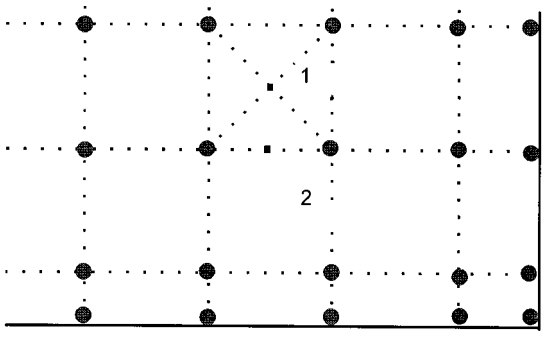
- at centre between supports, pos. 2;

- nearby the supports, pos. 3;

- at any other point which it is considered may be a point of weakness.

If those pre-tests are not carried out, the testing authority shall declare the reasons why not. If the distance between the pedestals differs, the worst case shall be tested.

Apply a steadily increasing load at a rate of 120 N/s ± 10 % until failure of any part of the element occurs.



Key

1 Indentor position 1

2 Indentor position 2

Figure 1 - Indentor positions for load and deflection test

5.3 Maximum deflection

5.3.1 Sampling

The test shall be carried out on the sample as described in 5.2.

5.3.2 Test Conditions

The test shall be carried out at a temperature of 20 °C ± 3 °C and 55 % ± 20 % R.H.

5.3.3 Test arrangement

The test arrangement shall be in accordance with figure 2 or equivalent.

5.3.4 Principle

A steadily increasing load is applied to the hollow floor at a rate of 120 N/s ± 10 % until the working load is reached.

5.3.5 Configuration

The test configuration shall be in accordance with 5.2.5. The indentor cylinder has a 6 mm hole at its centre. At a minimum height of 25 mm there is a “window” inside the steel cube to see the 6 mm hole (see figure 2). A scaled measuring stick of 5 mm diameter and a length suitable to the hollow floor height shall be laid loosely inside the hole of the indentor. The readings of the measurements shall be within 0,01 mm.

Dimensions in millimetres

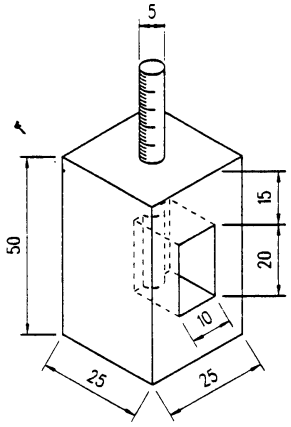


Figure 2 - Example: Indentor with scaled measurement stick

5.3.6 Procedure

Place the specimen on a rigid surface. Apply the load to the stated position in the middle of a grid. Clean and sand the load-bearing layer to a flat level.

Drill a hole of diameter 6 mm in the centre of the indentor position into the load-bearing layer. Insert the measurement stick through the hole down to the rigid surface.

Place a rubber plate of 3 mm thickness and 65 shore A hardness in accordance with ISO 48 between indentor and specimen.

Apply the load with a steel indentor in accordance with figure 2.

Apply a steadily increasing load at a rate of 120 N/s ± 10 % until working load is reached.

Read the move of the indentor corresponding to the measurement stick as maximum deflection.

5.4 Solidity of load bearing layer

The test procedure and size of the specimen are described in EN 196-1.

The prisms shall be produced with the same material which is used in the hollow floor construction.

These samples shall be tested with regard to the bending strength and compressive strength tested in accordance with EN 196-1.

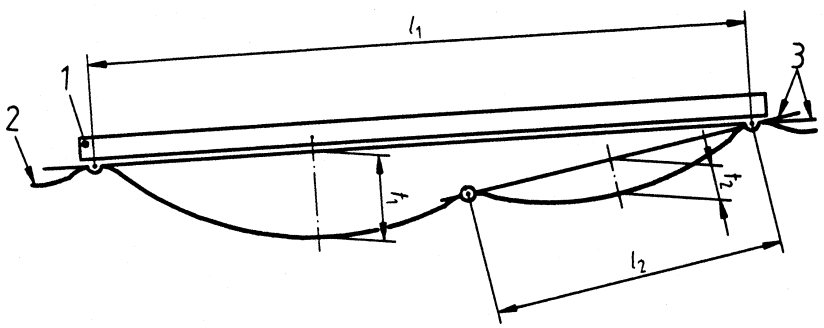
5.5 Dimensional deviations

5.5.1 Thickness of the load bearing layer

Control measurements of the thickness of the load bearing layer shall be done at random using a dial gauge with an accuracy of 0,1 mm and noted.

5.5.2 Measuring the flatness deviations

Verification of deviations from the flatness shall be done by individual measurement of limit values, e.g. spot check inspection (see figure 3) or by using a grid system to measure the levels. The grid shall be measured out.



Key

Points of surface
l_1, l_2 Length of straightedge

t_1, t_2 measured limit values

1 Straightedge

2 Actual surface

3 Line of straightedge

Figure 3 - Relation between point deviations and distances between measuring points during verification e.g. using a straightedge and wedge

5.5.3 Datum

The deviation from the datum shall be measured using an appropriate measuring device to an accuracy of 1 mm.

5.5.4 Cutout positions

The cut out position shall be measured using an appropriate measuring device.

5.6 Hard body impact test

5.6.1 Sampling

One specimen area shall be determined at random from the actual production.

5.6.2 Preparation and preservation of samples and test pieces

Tests are to be made at a temperature of (20 ± 2) °C and 55 % ± 20 % R.H.

5.6.3 Principle

To assess whether or not a specimen withstands an impact load from a hard body.

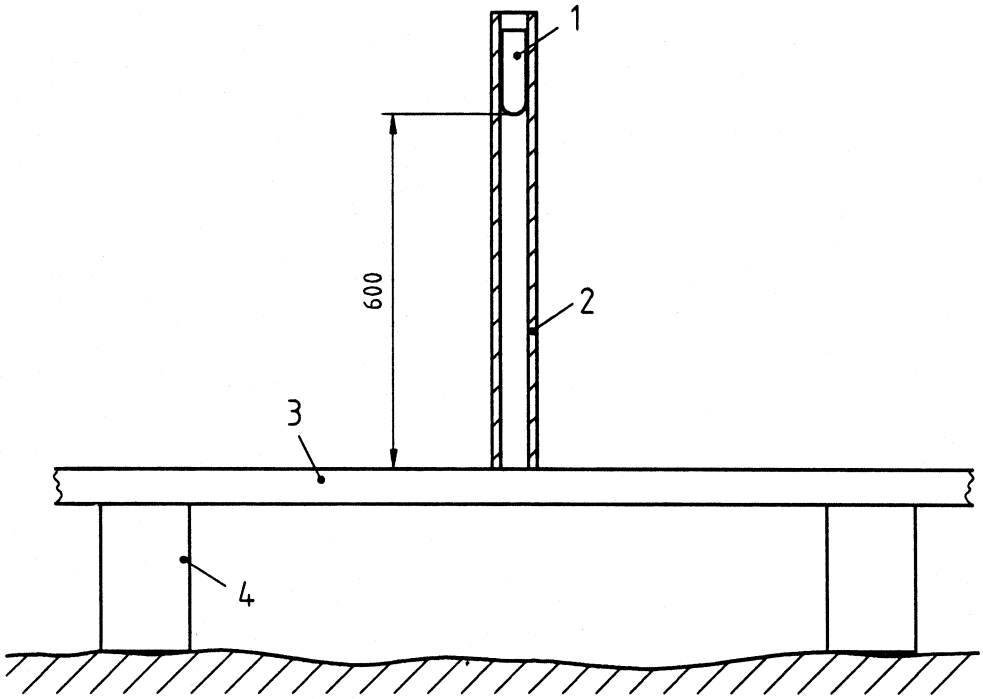
5.6.4 Apparatus

See figure 4.

5.6.5 Procedure

Drop the steel indentor weighing (4.5 ± 0,05) kg with a 50 mm hemispherical end inside a guide tube 55 mm in total diameter onto the test specimen from a height of (600 ± 10) mm at the weakest point of the specimen e.g. see figure 1.

Dimensions in millimetres



Key

1 4,5 kg indentor

2 Guide tube, 55 mm diameter

3 Load-bearing layer

4 Support

Figure 4 - Hard body impact test

5.7 Air tightness test for ventilated floors

5.7.1 Sampling

The test specimen is produced at the testing laboratory as stated and determined by the manufacturer. The specimen shall have a surface area of at least 4 m^2.

5.7.2 Test conditions

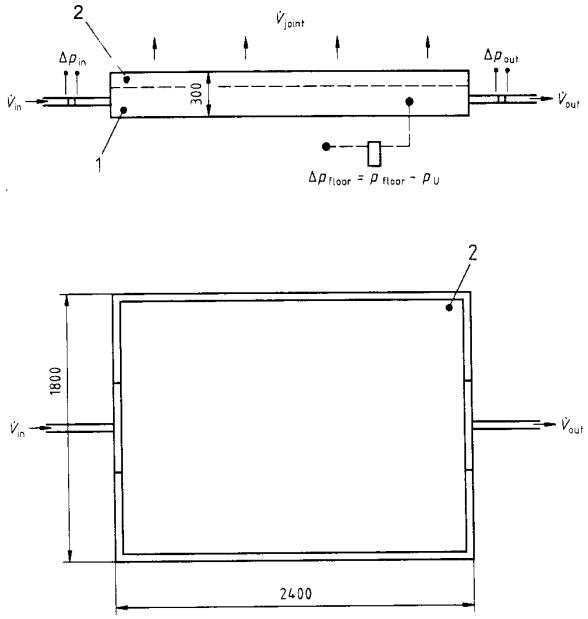
The test shall be carried out at a temperature of 20 °C ± 5 °C and 55 % ± 10 % R.H.

5.7.3 Principle

The specimen shall be placed on a pressure box. The decline of pressure and the leakage rate are measured.

5.7.4 Apparatus

The pressure box shall enable a static pressure to be measured, see figure 5.



Key

1 Air tight pressure box

2 Hollow floor

Figure 5 - Pressure box for measurement of air leakage

5.7.5 Procedure

The pressure shall be applied to the pressure box at steps 3 Pa, 5 Pa, 10 Pa, 20 Pa, 50 Pa and the leakage rate of air volume shall be measured at those conditions.

The air leakage coefficient shall be calculated from the air leakage rate at 10 Pa as follows:

$a = V/(l \times p^{2/3})$

Where :
a = air leakage coefficient [$m^3/(m\ h\ Pa^{2/3})$];
l = length of gap [m];
p = pressure difference [Pa];
V = relative air volume flow [m^3/h].

6 Evaluation of conformity

6.1 General

The compliance of a hollow floor with the requirements of this standard and with the stated values (including classes) shall be demonstrated by:

- initial type testing

- factory production control by the manufacturer, including product assessment.

For the purposes of testing, floors may be grouped into families, where it is considered that the selected property is common to all floors within that family.

NOTE A family is a group of products within which a change of components does not affect the characteristic(s) stated.

6.2 Type testing

6.2.1 Initial type testing

Initial type testing shall be performed on first application of this standard. Tests previously performed in accordance with the provisions of this standard (same product, same characteristic(s) , test method, sampling procedure, system of attestation of conformity, etc.) may be taken into account. Whenever a change occurs in the floor design, the raw material or supplier of components, or the production process (subject to the definition of a family, see 6.1), which would change significantly one or more of the stated characteristics, the type test shall be repeated for the appropriate characteristic(s).

If tests or assessments (e.g. reaction to fire, release of dangerous substances) have been performed in accordance with the provisions of this or other European standards and are stated with the component or raw material concerned, the manufacturer of the hollow floor need not repeat the test or assessment.

Characteristics determined without test (e.g. reaction to fire Class A1 without testing or emission of dangerous substances by controlling content) are not subject to initial type testing.

The results of all type tests shall be recorded and held by the manufacturer for a period of at least five years.

6.3 Factory production control (FPC)

6.3.1 General

The manufacturer shall establish, document and maintain a FPC-system to ensure that the product placed on the market conforms with the stated performance characteristics. The FPC-system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials or components, equipment, the production process and the product.

A FPC-system conforming with the requirements of the relevant part(s) of EN ISO 9000, and made specific to the requirements of this standard, will be considered to satisfy the above requirements.

The result of inspections, tests or assessments shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded.

6.3.2 Equipment

All weighing, measuring and testing equipment used by the manufacturer shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.

6.3.3 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, as shall the inspection scheme for ensuring their conformity.

6.3.4 Design process

If design or calculation has been used, (except where verified by testing), the FPC-system shall document the design of products, identify the checking procedure and those individuals responsible for the design.

During the design process itself, a record shall be kept of all checks, their results, and any corrective actions taken. The record shall be sufficiently detailed and accurate to demonstrate that all stages of the design phase, and all checks, have been carried out satisfactorily.

7 Marking, labelling and packaging

7.1 Marking and labelling

The following information shall appear on the accompanying commercial documents:

- The manufacturers' trademark or identification mark;

- The number and year of this European standard;
- The year and month of marking;
- The following characteristics (as relevant):
  - reaction to fire;
  - resistance to fire;
  - load bearing capacity;
  - safety factor;
  - electrostatic conductivity;
  - impact sound insulation;
  - airborne sound insulation;
  - thermal conductivity.

The components shall be identifiable so that they can be linked to the element and thereby to the commercial documents.

7.2 Packaging

The packaging shall ensure that the product will be transported and delivered without any damage and shall provide protection against humidity.

Annex A

(informative)

Hygiene

Experience shows that, if the relative humidity in the void is more than 80%, hygienic problems may occur. In such cases either measures should be taken to avoid high humidity conditions occurring or if this is not possible, other appropriate measures should be taken to avoid hygiene problems.

Annex B

(informative)

General information

The thickness of the load bearing layer should be controlled during installation in order to guarantee the load bearing requirements.

The thickness of the load-bearing layer should be controlled during installation in such a way as to ensure that the load bearing requirements of clause 4.4.1 are met.

The type and quality of the insulation should be chosen by consulting relevant literature.

Bibliography

EN ISO 9000

Quality management and quality assurance standards

HD 384.4.41

Electrical installations of buildings – Part 4: Protection for safety; Chapter 41: Protection against electrical shock

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